INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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VACATION DAYS

To all of its readers, INDUSTRIAL ARTS AND VOCATIONAL EDUCATION wishes a thoroughly enjoyable vacation. Since the closing of school precedes the vacation period, the reader's attention is directed to the *Checking List for Closing Industrial-Arts Shops* prepared by H. L. Stiles. It appears on page 232 of this issue.

The rich offering on tests and testing written for this issue by Homer C. Rose and Roy R. Van Duzee Herbert K. Iverson, Stanley S. Radford, G. L. Simnicht, and Fred W. Weyer, may also be of use to many as the end of the school year approaches.

Attention is also called to the editorial entitled *Planning for the New School Year* on page 235. It may give some helpful suggestions for the improving of next year's work.

IN THIS ISSUE

This number of INDUSTRIAL ARTS AND VOCATIONAL EDUCATION is particularly rich in thought-provoking articles. The ones written by Ray O. Mertes and L. Henry Noble, Charles H. Sleeter, John T. Shuman, F. C. Finsterbach, and M. S. Olsen, are of general interest to all our readers.

Clifton Resch and William A. Sears have contributed worth-while safety articles.

W. H. Bowers, Francis J. Coyte and John Emmel, W. F. Douglass, Stephen J. Smith, and C. K. Lush, have written articles that will be welcomed by instructors of woodwork.

Architectural-drawing teachers will do well to read R. Hammes' contribution.

The articles by William J. Becker, W. Ben. Hunt, James McGregor, and T. B. McGraw, will, no doubt, be found helpful in many camp shops during the coming summer.

The *Adjustable Wrench* by L. C. Petersen, is a good project for the machine shop or the metal shop.

Articles Indexed — The articles contained in the Magazine are regularly indexed in "The Readers' Guide to Periodical Literature," and "Education Index."
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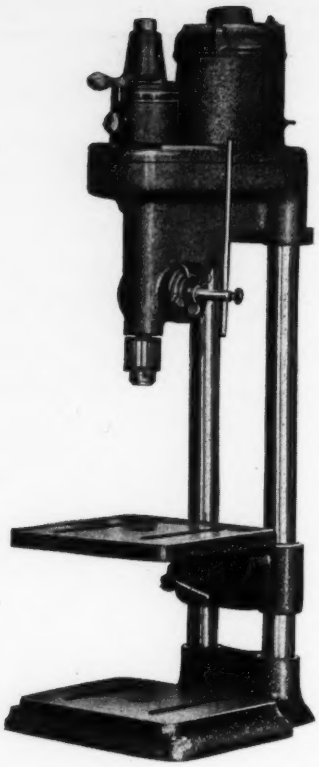
W-30 DRILL PRESS



This drill press is accurate! *Two* heavy supporting columns, a heavy, ribbed, nickel-alloy cast-iron table and a 7⅜" bearing surface in the quill housing help to make it so. The use of a taper-mounted, absolutely balanced and true-running key-type chuck further increases its accuracy.

It is also remarkably easy to operate for it is the only drill press on which you will find MULTISPEED Drive, an exclusive development, which provides any speed from 800 to 4000 R.P.M. without changing a belt or shifting the motor. The fully enclosed depth gauge can be set accurately without calculation or uncertainty. The built-in spindle lock, another exclusive feature, holds the spindle securely while opening and closing the chuck.

Its uses are not limited to drilling operations alone. Routing, shaping and mortising are entirely practical on this drill press. The additional equipment needed is available at a small extra cost. A production type table with a heavy trough all around tapped for piping can be supplied if desired.

Now is the time to think about replacing worn-out, obsolete equipment with new, modern machines. You no doubt have realized many times how well one or more of these drill presses would fit into your present shop set-up. They match the performance of larger production machines . . . they incorporate new exclusive features . . . they cost very little to operate . . . and what is more, they represent a smaller original investment. You get more equipment for the same amount of money, thus are able to provide increased facilities for your students from your regular budget appropriation. It is really something to think about . . . and act upon accordingly!

YATES-AMERICAN MACHINE COMPANY • BELOIT, WISCONSIN

This is the eighth of a series of brief articles dealing with various woods, their properties and uses. It is our hope that they might make interesting and helpful classroom material. We will welcome your suggestions as to the species of wood you would like featured in this series.

YATES-AMERICAN

SHORT TALKS ON WOOD

BLACK WALNUT *(Juglans nigra)*

One of the most beautiful and prized of our native hardwood species. The wood is heavy, hard, strong, shock resisting, non-warping and evenly textured. Responds readily to woodworking processes. Takes a beautiful polish. Heartwood is a rich chocolate-brown; sapwood is creamy white.

The principal use of walnut is in furniture manufacture. In addition, it is used extensively for veneers, interior finishing, radio and sewing machine cabinets, and gunstocks. The nut is well known for its tastiness and nutritive qualities.

Main commercial sources are Missouri, Kansas, Iowa, Illinois, Indiana, Ohio, Kentucky and Tennessee. Prefers well-drained soils with abundant moisture. Easily propagated, grows rapidly.

In the forest it frequently attains a height of 100 feet with a straight trunk 2 to 4 feet in diameter, clear of branches for half its height. In the open it is branchy, short-trunked and wide spreading. Lends itself to a variety of landscape effects.

The bark is thick, dark brown in color, and deeply divided into broad, rounded ridges. The leaves are compound, alternate, 1 to 2 feet long, consisting of from 15 to 23 leaflets. The leaflets are yellowish-green, about 3 inches long, extremely tapering at the end and toothed along the margin. The fruit is a nut, borne singly or in pairs, enclosed in a solid green husk. Nut itself has a black shell which encloses a rich, oily, edible kernel.

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

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Personality Guidance and the School Shop

Ray O. Mertes and L. Henry Noble
Public Schools,
Beloit, Wisconsin

An earnest plea to make the intangibles an integral part of school-shop work and of guidance.

Every student must be helped to succeed. In the majority of cases, it is not only the subject matter, the activity, or the amount of either which he retains, but rather the student's personality, character, disposition, ability to adapt himself to varying conditions, and his estimation of himself that are far-reaching.

In a discussion of industrial arts and its relation to a program of guidance it is assumed that most educators and workers in the field are familiar with the two generally known types of guidance; namely, vocational and educational. But how many teachers, regardless of subject taught are consciously aware of that extremely vital type of guidance — personality guidance?

In the past few years personality guidance has been receiving attention in the schools through the period given to home-room guidance. Experience however, has shown that much of the personality guidance which is tried in the home room is definitely only guidance for that period alone, and does not always carry on through the rest of the day or even through the next hour's class. Certain aspects of guidance do offer themselves to this *mass* guidance program, but in the main the home-room, as a place for guidance, has outlived its usefulness. This failure on the part of the home room period has been due to too much formalizing of teacher activity.

The home-room teacher is in most cases a subject-matter specialist. Such subject-matter specialists fail to realize the opportunities offered for individualized guidance. For the most part, they teach as they were taught.

In a manner, the individual subjects usually offered to make up a course of study in industrial-arts work may or may not have any direct relationship to each other. Too often do instructors think only of subject matter — woodwork, bench metal, machine shop, sheet metal, or whatever else may be taught. Teachers often think only of imparting information. In so doing they lose sight of the fact that the schools, just as industry, have to furnish a product, and that product is the *finished boy*. It is quite true, the boy must acquire certain knowledges in order to meet standards set up by educational systems and promotional schemes. Apparently we must continue to practice the use of measuring the educational accomplishments of students by means of the yardsticks of tests, and examinations to determine what knowledge and skills they acquire.

If one examines courses of study he does not generally find any provisions made for personality guidance. Naturally, this is sadly neglected by teachers who just teach the *subjects*.

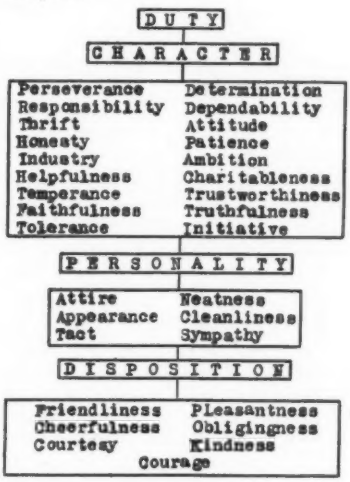


Fig. 1

Where then, if the student is to receive the kind of guidance necessary to succeed in life, is he to get it? If the home room as a guidance organ has outlived its usefulness, where does personality guidance belong? It is only obvious to conclude that the classroom of every teacher should be the laboratory for imparting this most necessary guidance. The classroom is the place where opportunities for guidance present themselves as live situations. Curriculum specialists, principals, and teachers must be conscious of this fact and must realize that *education, curriculum,* and *guidance* are synonymous terms. Until this fact is realized no real concentrated effort on personality guidance can ever take place in our schools.

The chart shown in Figure 1, may serve as a guide to indicate many contributing factors which go to make up the ideal individual. The development of these attributes will materially assist the individual in making social adjustments — will instill in the individual's mind the fact that his classmate, neighbor, or coworker has also a right to live and is entitled to receive the cultural heritage of his people.

Even industry has developed certain standards of achievement for its employees and future employees. The schools in the past had standards to guide them similar to those of today. Have not these standards been only the absorption or, let us say, exposure to certain facts many times irrelevant to the wants and needs of the child, of society, and of the community? Employers are not concerned only with the mental and manual accomplishments of the prospective employee, but are concerned more with the many subsidiary accomplishments of the person in question. They are not only interested in the individual as a draftsman, patternmaker, or machinist, but they are vitally interested in him as an *individual*. According to Doctor A. H. Edgerton of the University of Wisconsin, the success of workers is largely determined by their ability to adjust themselves to conditions as they exist. They must have learned to live with others. They must have learned to live.

Industry starts its manufacturing process with raw materials, which differ in shape, color, and texture. Some may be hollow, some transparent; others may be pliable, brittle, soft, hard, rough, or smooth. From these raw materials industry produces by the processes of change, correction, alteration, assembly, and finish,

products which satisfy the demands set up by man.

As industry starts with raw materials so does the school. As industry produces worth-while products to satisfy the needs of the human race, so should also the school. As industry spares no effort to supply the best finish — finish with luster, attractiveness, and lasting qualities so *should* also the schools.

The raw materials with which the schools are confronted like those in industry, are not alike. They come from different homes, different environments, different experiences. Since birth they have been subjected to different types of living. Their training has very largely influenced their characteristics. They are for the most part just as they have lived. It cannot be expected, nor is it desirable, that this human raw material with which the schools must work, should be of like nature. We must have *individualized* individuals.

Sadly enough, many students have not had sufficient nor proper guidance. This lack of training can be traced back to the preschool days where either neglect or ignorance on the part of the parent has failed in the initial molding of the individual toward an integrated personality. The child is the individual he is, because of his heredity and environment, and it is the duty of the school to remold the individual into one with characteristics favorable to success in life. On the other hand, we are happy to admit that many students have been brought up under the proper influence and need only to be encouraged to maintain desirable characteristics.

Since these desirable characteristics can be acquired only by constant repetition, it is necessary that every teacher be mindful of that fact and make a sincere effort to assist students in gaining, developing, and retaining these desirable attributes.

Shop classes offer an ideal arrangement for the development of character. Students in the school shop find themselves in circumstances which give them a great deal of freedom that they cannot usually enjoy in regular academic classes. They are permitted to move about in the room, to converse with their fellow students, and to help each other with their problems. Some shop classes are so organized that individual members act as foremen, teacher-assistants, or have other definite duties assigned to them. A student may work at a speed which is established by himself and his work is largely determined by a standard of quality which is determined by his ability and desire. In short, the boy is *on his own*. Shopwork is of a nature which approaches life conditions as they will be after the boy finishes his schoolwork. The boy has a task to perform. The better the deed, the better the pay, or grade.

While performing his tasks, does he prove himself to be a good citizen? Is he able to get along with his fellow workers? Is he desirous of giving a helping hand when he is requested, and is he willing to take responsibilities? Is he anxious to develop attitudes toward the shop, his work, and his classmates? Is he able to ask for supplies in the right manner? Can he appreciate the other fellow's efforts, problems, and troubles? Is he concerned about the appearance of the shop in general? Does he appreciate the tools and equipment with which he is working and does he treat them in a thoughtful manner? Is he thrifty with the use of the tools, equipment, and supplies found in the shop? Is he thrifty with the use of time? Does he co-operate in the matter of shop management even to the point of offering assistance of his own accord? Is he ready to start work on time and to stop when the signal is given? Can he say *thank you?*

If such is the case, then the individual has most of the earmarks of personality training, and the instructor need only be concerned about imparting instructional material and information. If not, then the instructor must broaden his view and include the development of the qualities just cited. Aside from setting up some very definite regulations to govern shop attitudes, this program of character development cannot be carried out at a definite time or circumstance. It must be made a part of the regular work and must be presented when the opportunity presents itself. When a boy goes to the instructor and says, "I want some sandpaper," the instructor should then discuss the proper method of making this request. This information should not be given to the class but to the individual student. If on the other hand a boy has done something of a commendable nature, then it might be well for the instructor to make mention of the fact. Certainly the boy should receive praise for doing the right thing at the right time, and especially so if the deed is the result of effort on the part of the individual. Shopwork does offer a real opportunity for doing this.

In determining the types of guidance that should be offered by the school, it is necessary that the school take an active part in the life of the community.

It is necessary that the old, stilted, and trite subject-matter curriculum be discarded for curriculum and courses of study which teach the *child* to live in a changing society, and which are based on the child as the basis of the curriculum rather than tradition and the schools. Guidance is the essential part of any curriculum that is to prepare for *life*. It is essential, if the school system is to best serve the needs of the child and the community, that an acquaintance be made with the community needs — industrial, vocational, avocational, and personality. It is a known fact that of the thousands of high-school people who will graduate or who have already graduated that only about 20 per cent enter a school of higher learning. What are the schools doing for the 80 per cent who are dependent upon the community for life and a livelihood Are the schools of today teaching as best they can?

In answer to the last two questions a recent survey was made by the authors, of the 62 industries represented in the city of Beloit, Wis., which is strictly an industrial community of about 25,000 population. Aid on the survey was secured from the local paper, *Beloit Commercial Club*, and time was received through the co-operation of the board of education and of the superintendent, Mr. D. F. R. Rice. The personal interview method was first used with a questionnaire follow-up.

The work was divided into two sections for the purpose of getting together information of a historical and general nature to be used for imparting information of a vocational nature; and, the second part was concerned with information relative to reactions of industries to the subjects that are and ought to be taught in the schools.

The results of the first section of the survey were used in the writing up of a series of articles pertaining to these industries. These were mimeographed and have appeared in booklet form under the heading "Beloit and Its Industries." This booklet is now being used by the social-science students in the ninth grade of the Beloit junior high schools.

The second section of the survey, which the writers consider most valuable from a personality guidance and curriculum viewpoint, included the following questions, with the inclusive resultant information. The answers cited represent a random sampling of information gathered.

Question 1: What subjects can be taught in the schools to better qualify a graduate for selective placement?

*Industry Number**	*Subjects*	*Comments*
21	Shop mathematics, trigonometry, mechanical drawing, shop subjects, blueprint reading, metallurgy, cost accounting, slide rule, industrial organization and relation, typing, comptometer, tabulating machine.	"The men we employ are largely metalworkers, machine operators, machinists, electric welders, toolmakers, etc."
15	Industrial management, general engineering drawing, elementary economics, logic, shop practice.	"Make most of these subjects compulsory."
25	Mathematics, sciences, health subjects.	"The teaching of health subjects should be stressed in order that regularity of employment might be assured."
7	English, composition, spelling, punctuation.	"Handwriting in schools today is abominable."

*The names of the industries are withheld due to the nature of the comments.

Industry Number	*Subjects*	*Comments*
26	Office and shop management, blueprint reading, machine-shop practice, mechanics of machines.	"Create a desire on the part of boys to become good mechanics."
17	Salesmanship, chemistry.	
59	Mechanical drawing, mathematics, machine-shop training.	"Courtesy above all."
63		"The subject of hard work and honest endeavor."
39	Mathematics, English.	
40	Speech.	"Some classes to teach students to meet the general public and understand them."

Question 2: In your estimation what subjects would be of the greatest benefit to the student who quits prior to graduation?

Industry Number	*Subjects*	*Comments*
15	Elementary economics, logic, shop practice.	"Make most things compulsory that are along shop lines."
25		"Placement demands graduation from high school."
7	The three R's.	"You can never get too much of the three R's into them."
26	Office and shop management, machine-shop practice, mechanical operation of various types of machines, salesmanship, mechanical drawing.	"Vocational subjects."
39	Mathematics, speech.	"More stress on benefits resulting from continuing on to graduation.'

Question 3: Does industry use any selective method of placement of prospective employees?

Industry Number	*Yes or No*	*Qualifications for Placement*
45	Yes	"Past performance."
30	Yes	"High-school graduates. Neat appearance. Reasonable intelligence and ambition."
20	Yes	"Advance as they learn."
26	Yes	"Apprenticeship work."
7	Yes	"Character and general reputation, first. Second, intelligence and probability of absorption. You might be surprised by the statement that handwriting is one of our strictest requirements for office workers. It tells us volumes about an employee."
25	Yes	"Apprenticeship sources and training."
13	Yes	"Experience, ambition, education and willingness to continue study. Sincerity of purpose."
19	Yes	"School records."
21	Yes	"Personnel department, acquainted with principles of job to be filled, which picks applicants qualified to meet requirements."

Question 4: Is there any relationship between success in school and success in industry?

Industry Number	*Degree*	*Comments*
19	Some	
13	None	"The sincerity of a mediocre student may make him more valuable than a student who lacks this quality. The ability to apply *book knowledge* to the practical problem at hand is more important than good grades."
25	Great deal	"Success in school and success in industry go hand in hand. There is a definite relationship existing between good scholastic standing in high school and success in later life."
7	Very little	"If by success in school you mean individual grades. We believe that all grade markings in schools should be absolutely abolished."
20	Great deal	"99 per cent perspiration, 1 per cent inspiration."
59	Great deal	"Success in school calls for the right attitude and ambition. These are also important in industry."
63	Great deal	"A lazy, dishonest student will not fit into industry."
40	Great deal	"Book learning is *not* the essential thing in business."
45	Great deal	
21	Great deal	"Without question there is a close relationship between success in school and success in industry."

Question 5: Could industry as well as the individual benefit by an observation of phases of work with the industry?

Industry Number	*Yes or No*	*Comments*
45	Yes	"This method should be employed by all. Anyone before deciding on a profession or business should make a study from all angles of the business."
40	Yes	
63	Yes	
59	Yes	
17	Yes	
7	Yes	
25	Yes	
13	No	"There would be no mutual benefit unless the period of observation were quite long. A short period would result in too many mistakes. This would be expensive to industry."
21	Yes	"We believe that students should be given some opportunity to observe; to assist them in their future occupation. A workman does his best on the thing he is most interested in and if he can determine the thing he will like best prior to entering industry many misplaced men will be avoided and much wasted effort prevented."

Question 6: (Part A) Would industry favor the publication, in mimeographed form or otherwise, of the salient points to look for in an hour's visit?

Industry Number	*Reactions and Comments*	
19	No	
21	Yes	"Our industry would be glad to co-operate in the preparation of such a pamphlet."
13	Yes	"It would be quite a timesaver for the industry and it would not be so confusing to the student."
25	Yes	
7	Yes	
17	No	"It is impossible for anyone to really know our particular field in one hour."
20	Yes	
59	Yes	
30	Yes	
45	Yes	"You would be welcome to any conclusions you may form of the industry."
40	Yes	

Question 6: (Part B) Would industry favor limited visitation by groups of probable employees?

Industry Number	*Reactions and Comments*	
19	No	
21	Yes	"Our plant would not only favor, but has encouraged such visitation in the past."
25	Yes	
7	Yes	
17	Yes	
20	Yes	
59	Yes	
30	No	"Not in this industry."
45	Yes	"If it did not occur too often so as to interfere with the regular work."
40	Yes	

Question 6: (Part C) Since teachers should be thoroughly conscious of industry and its work, can a feasible plan, through visitation, and the like, be worked out wherein the success of the entire venture would be aided?

Industry Number	*Reactions and Comments*	
19	No	
21	Yes	"A plan for teacher's contact with industry can and should be worked out."
13	Yes	"Visitation by teachers would be most desirable. A good understanding of the industry is essential in order that class visitations would be profitable and that questions could be intelligently answered after such visitation."
45	Yes	"We suggest that teachers look over the work and then decide if it would be of interest to them in their plan before bringing students around."
25	Yes	
7	Yes	
17	Yes	
20	Yes	
59	Yes	

Question 7: The number of boys and girls in a graduating class will be about even. Of this number 20 per cent of the boys and 25 per cent of the girls continue with their schooling. What per cent of the remainder can your industry absorb?

Industry Number	*Number*	*Comments*
45	None	"Few people will take the time to learn this work. There is no pay connected with the learning."
30	None	
6	6 each year	
25	?	"No general rule will apply since production is quite variable."
13	?	"Impossible to estimate."
21	50	"While it is hard to accurately gauge the requirements of any industrial establishment for any particular period, we feel that we could absorb 25 high-school graduates each year in mechanical apprenticeships, and an additional 25 as trainees, junior clerks, etc. All apprentices as well as the greater portion of the latter would be boys."
19	None	"We find it takes more mature persons in this industry."

Conclusions

From the aforementioned data, and from personal interviews, the following conclusions may be drawn.

1. Industry is anxious that the public schools teach more vocational subjects.

(NOTE: This view is directly opposed to the view taken by most educators today; namely, that the public schools should teach along cultural lines until the student reaches the age of 18, after which there should be specialized vocational training.)

2. Most of the major industries have again returned to the apprenticeship system of placement.

3. Most industrial men take the view that success in school and success in industry have a close correlation.

4. Character, general reputation, and ambition seem to be attributes favored first in a candidate for placement. "Book learning" if not of a practical nature is relegated to a secondary position.

5. Most industries favor the publication of study sheets for the use of teachers and students prior to making a shop visit.

6. Most industries are in favor of having the boys visit industrial shops.

7. Industries favor teacher education pertaining to the industrial setup through a plan of visitations and the like.

8. Very little information can be gathered relative to the absorption of future high-school graduates. Industrial men state they cannot gauge production for future periods of time.

From these conclusions it can be readily seen that *personality* guidance is after all very essential for success. Without *character, personality,* and an *ideal disposition,* the individual is handicapped throughout life. In determining what and how we teach, we must take into consideration the four C's of success — *character, courage, co-operation,* and *courtesy.* As industry spares no effort to add luster, attractiveness, and lasting qualities to its product, so *must* the school put the finishing touch of *personality guidance,* on its product — *the boy.*

Safe and Effective Press Feeding

Clifton Resch

Central High School,
Grand Forks, North Dakota

Safety and economical learning are prime objectives of any shop course. There must be other worth-while aims, but a realization of these rests upon the two previously mentioned. If the foundation is solid, it is reasonable to believe that the superstructure will also be substantial and long lasting. Without safety and economical learning making a positive contribution to shop classes, there can be little but disappointment and regret.

This article deals with a safe and effective manner of teaching beginners to learn to operate the press, a method that the writer has used for several years at the trade as well as in the classroom. During this time there have been no accidents of any nature, the amount of time required to learn to feed the press has been greatly decreased, and the quality of the product during the learning period has been materially improved and greatly increased.

Before beginning presswork, the student should understand a few general principles. There will be a variance among instructors as to what prerequisites should be demanded. Surely the three ideas stated in the following will be required of the student if he is to be successful in mastering a new and strange operation.

The first idea that must be made a part of the student's thinking is this: "I am working for accuracy and ease of manipulation. Speed will follow in due time and needs no consideration now." It sounds like a rather abstract idea, but once the student expresses this attitude toward his work, he has made a large adjustment.

The acquiring of a new skill is always accompanied by an excess of nervous energy which inhibits rather than aids in the learning process. This new attitude will serve as a safety valve to release that tension.

It is customary to start the beginner's feeding experience on platen presses. Much depends on his introduction to this work.

Proper lubrication of the press is important from the safety angle as well as the common-sense point of view. To illustrate this, show the student how lack of lubrication of the roller-carrier assembly might cause the press to throw a roller with probable damage to the press and possible injury to the person feeding the press. It is necessary that the student shows consideration, yes, even respect, for the machine he is about to learn to operate.

The last and perhaps least important of the three ideas is a very general under-

standing of the principle of make-ready. If the student realizes that a sheet of tissue paper can make a difference in impression, he is going to be more cautious about feeding "doubles," for two reasons: It isn't craftsmanlike, and it causes unnecessary wear on the type and press.

A student who has the foregoing ideas well in mind is equipped to start work intelligently on the press.

Since the platen on the press remains in a stationary position while the printed sheet is being withdrawn and a blank one placed on the tympan, the pupil may practice feeding the press without having the press running. Nothing will have to be unlearned when the press is started. When he can feed fifteen or twenty consecutive sheets in a smooth rhythmical order, the press may be started on a very slow speed and feeding continued without using the impression lever. When this stage has been mastered, he should be asked to notice which finger on his left hand seems most natural to use in withdrawing the sheet. A sandpaper finger stall is placed on the finger, and he continues until he can: (1) Consistently register all sheets to all pins, (2) withdraw them naturally using one finger and thumb, and (3) jog them into a neat pile on the delivery board. About 95 per cent of all work can, and should be, jogged as it is fed. For this reason, jogging should be taught as an integral part of the process.

No actual printing should be begun until the student feels at ease with the press running as he registers and withdraws blank sheets. Before printing is started, gripper fingers are attached to the

Fig. 2. The stock is against the bottom pins and being slid toward the head pin. The fingertips will lightly trace the path indicated by the arrow. The pressure of the fingers on the paper will gradually decrease. Continuation of the stroke after the sheet is registered to all pins will prevent the sheet from jumping away from any pins. Notice the left hand jogging the printed sheets. Gripper fingers are used as a safety measure

Fig. 1. As the fingertips are lightly dragged across the stock, the top sheet is "feathered" off. Not until then is the thumb placed on the underside of the sheet. Note that the platen is not in printing position, but the grippers are flat against the tympan

grippers. If this is impossible, take a piece of nonpareil reglet that is long enough to extend from one gripper to the other, and tie it on the extreme ends of the grippers on the side closest to the type form. Care should be taken so that the grippers and reglet clear the quoins as well as the type form. The reason for this is obvious: The grippers are in position against the tympan when there are still three or four inches of clearance between the top of the platen and the press bed. See Figure 1. If the embryo press feeder feels something strike the back of his hand he is going to withdraw it quickly enough to avoid injury. Although the student very seldom leaves his hand on the tympan long enough for the gripper fingers or reglet to touch, it is much better to always take the precaution and avoid the possibility of injury.

Anything and everything should be done to ease the tension under which the student works. Place a little confidence in him, give him pointers, and then go away and leave him for a while. One form of final instruction that has worked very well is this: "You are getting along fine. Take your time. Don't grab after a sheet if you notice it is in crooked. Use the impression lever. Keep your head and you will keep your hands."

The mechanics of placing the sheet on the tympan deserves consideration, as it is here that greatest difficulty is encountered. A little glycerine is placed on the palm of the left hand, the finger tips of the right hand are rubbed in the left palm and then wiped dry on a clean cloth or apron. In taking the sheet from the pile on the feed board, the finger tips very lightly drag across the top of the pile as the right hand moves toward the body of the operator. This drags the top sheet over the edge of the pile and it is then picked up with the thumb and fingers of the right hand, as shown in Figure 1. As the press opens, the sheet is carried to the tympan and as soon as the paper touches the draw sheet the thumb is taken out from under the sheet. This is important. The paper is guided so it strikes the two bottom pins gently. At the same time, and not until then, it is slid along the two bottom pins toward the head pin as shown in Figure 2. This is best accomplished by crooking one or two fingers so they are about perpendicular to the paper. If the sheet is registered to the pins in this manner, there will be no bouncing away from the pins. The general direction of the register stroke will be parallel to a line drawn from the closest right-hand corner of the paper to the head pin, as indicated by the arrow in Figure 2. As the stroke progresses, there should be a diminishing pressure of the fingers on the paper. If extended, the register stroke would always leave the paper between the head pin and the bottom edge of the paper.

Always place the head pin above the center of the sheet. On a letterhead-size sheet, the lower left pin should be about 2 or 2½ in. from the corner, and the lower right pin about 1½ in. from the corner when the sheet is in printing position.

As soon as the press opens, the printed sheet is withdrawn and a blank sheet registered to the pins on the tympan. Both hands should be in play at the same time. This is shown in Figure 3. A study of Figures 1, 2, and 3 will help clarify the foregoing information.

A few precautions taken by the instructor in selecting and cutting the stock will be to the student's advantage. As briefly as possible, we might list them thus:

1. Select a stock of 20- or 24-lb. bond. Use of a heavier stock will result in *slid pins*. Any bond paper will slide nicely against the pins. Also, the surface is ideal for the beginner as he practices the register stroke.

2. See that the edge of the cutter knife is keen. A nicked knife will leave nibs

Fig. 3. Both hands are in play at the same time. The printed sheet is withdrawn with one finger (on which is a finger stall) and the thumb. The thumb of the right hand will be taken away from the underside of the blank sheet as soon as the paper strikes the typman

on the edge of the paper, which will prevent it from sliding smoothly against the pins. A dull knife will also seal the edge as it cuts, making sheet separation difficult. At best this is a troublesome part of the operation for the beginner to master while his attention is necessarily divided. Instructors who have operated any type of press with an automatic feeder will realize the importance of this point.

3. Stock of letterhead size is the most suitable. Initial efforts will give a more pronounced result on a smaller size, but in the long run it is more economical to use a large sheet for this reason: it is necessary to develop the idea of making the register stroke close to the bottom pins, and with small stock little attention would be given to this. Referring to Figure 2, it is evident that the curved stroke represented by the arrow would be *flattened* in running small stock. It is much easier for a student to flatten the register stroke than it is to put more dip into the stroke.

Doubtless there are other factors that will affect the learning process, such as light, equipment, ability of the student to concentrate, and his freedom from distraction that can exist only in a well-ordered shop.

In brief form, the fundamentals have been presented for a method of teaching press feeding in an economical and effective manner, regardless of the point of view. Of greatest importance is the fact that the process is practically foolproof from the standpoint of safety.

Some suggested precautions sound trivial, but failure to heed them will handicap the student, or make the task more dangerous, and after all, we are working for the welfare of the student.

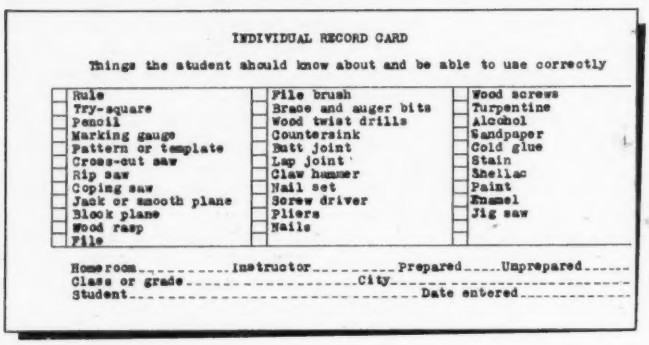
Individual Record Cards

Charles H. Sleeter

Ossining, New York

A set of cards that may assist others to record the work done by their students.

These cards have proved very satisfactory in the general woodworking classes in the Ossining High School for the past three years. Three colors are used — the yellow for the seventh grade, the orange for the eighth grade, and the white for the ninth grade. The operations are progressive for these three grades. As the operations are completed a check is made in the adjoining squares. On the reverse side of the card are sections for all the marks necessary during the entire grade. In the upper left section is a place for

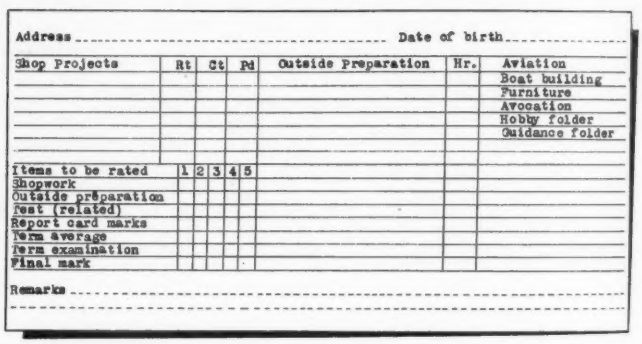


INDIVIDUAL RECORD CARD

Things the student should know about and be able to use correctly

Rule	File brush	Wood screws
Try-square	Brace and auger bits	Turpentine
Pencil	Wood twist drills	Alcohol
Marking gauge	Countersink	Sandpaper
Pattern or template	Butt joint	Cold glue
Cross-cut saw	Lap joint	Stain
Rip saw	Claw hammer	Shellac
Coping saw	Nail set	Paint
Jack or smooth plane	Screw driver	Enamel
Block plane	Pliers	Jig saw
Wood rasp	Nails	
File		

Homeroom ____ Instructor ____ Prepared ____ Unprepared ____
Class or grade ____ City ____
Student ____ Date entered ____

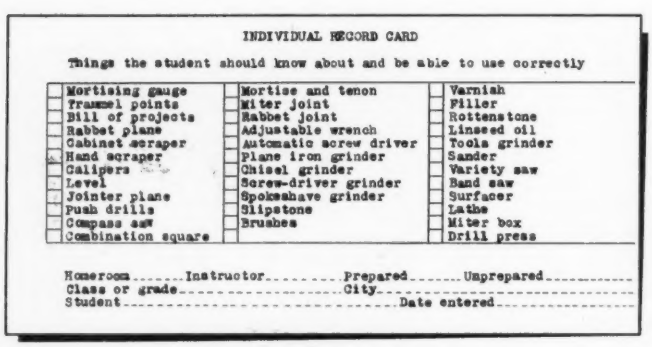


Address ____ Date of birth ____

Shop Projects	Rt	Ct	Pd	Outside Preparation	Hr.	Aviation
						Boat building
						Furniture
						Avocation
						Hobby folder
						Guidance folder

Items to be rated	1	2	3	4	5
Shopwork					
Outside preparation					
Test (related)					
Report card marks					
Term average					
Term examination					
Final mark					

Remarks ____

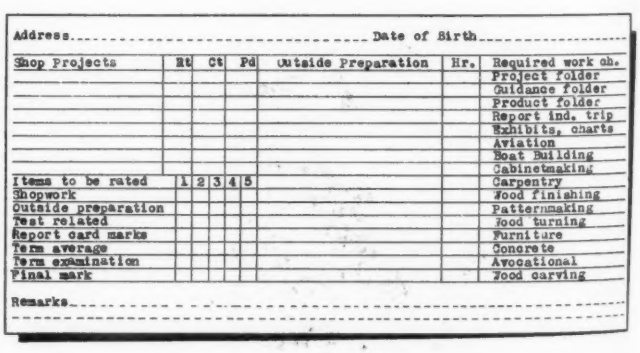


INDIVIDUAL RECORD CARD

Things the student should know about and be able to use correctly

Mortising gauge	Mortise and tenon	Varnish
Trammel points	Miter joint	Filler
Bill of projects	Rabbet joint	Rottenstone
Rabbet plane	Adjustable wrench	Linseed oil
Cabinet scraper	Automatic screw driver	Tools grinder
Hand scraper	Plane iron grinder	Sander
Calipers	Chisel grinder	Variety saw
Level	Screw-driver grinder	Band saw
Jointer plane	Spokeshave grinder	Surfacer
Push drills	Slipstone	Lathe
Compass saw	Brushes	Miter box
Combination square		Drill press

Homeroom ____ Instructor ____ Prepared ____ Unprepared ____
Class or grade ____ City ____
Student ____ Date entered ____

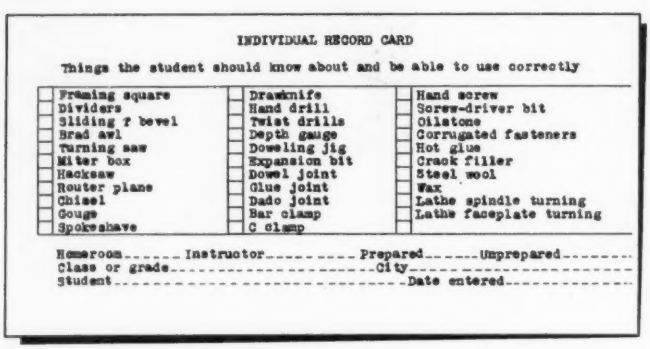


Address ____ Date of Birth ____

Shop Projects	Rt	Ct	Pd	Outside Preparation	Hr.	Required work ch.
						Project folder
						Guidance folder
						Product folder
						Report ind. trip
						Exhibits, charts
						Aviation
						Boat Building
						Cabinetmaking
						Carpentry
						Wood finishing
						Patternmaking
						Wood turning
						Furniture
						Concrete
						Avocational
						Wood carving

Items to be rated	1	2	3	4	5
Shopwork					
Outside preparation					
Test related					
Report card marks					
Term average					
Term examination					
Final mark					

Remarks ____

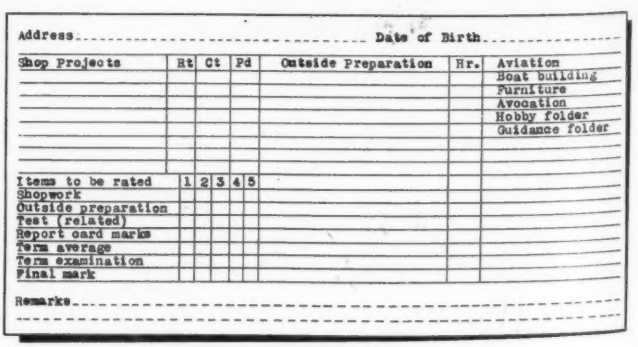


INDIVIDUAL RECORD CARD

Things the student should know about and be able to use correctly

Framing square	Drawknife	Hand screw
Dividers	Hand drill	Screw-driver bit
Sliding T bevel	Twist drills	Oilstone
Brad awl	Depth gauge	Corrugated fasteners
Turning saw	Doweling jig	Hot glue
Miter box	Expansion bit	Crack filler
Hacksaw	Dowel joint	Steel wool
Router plane	Glue joint	Wax
Chisel	Dado joint	Lathe spindle turning
Gouge	Bar clamp	Lathe faceplate turning
Spokeshave	C clamp	

Homeroom ____ Instructor ____ Prepared ____ Unprepared ____
Class or grade ____ City ____
Student ____ Date entered ____



Address ____ Date of Birth ____

Shop Projects	Rt	Ct	Pd	Outside Preparation	Hr.	Aviation
						Boat building
						Furniture
						Avocation
						Hobby folder
						Guidance folder

Items to be rated	1	2	3	4	5
Shopwork					
Outside preparation					
Test (related)					
Report card marks					
Term average					
Term examination					
Final mark					

Remarks ____

recording projects made in the shop. RT means rating, CT means cost, and PD means paid. The center column is for recording any work done in the home or out of school. HR means the number of hours spent doing each job. The last column is devoted to the various divisions of general woodworking. Each boy must complete at least one job from each group some time during the year. After that he is permitted to choose the jobs that he wishes to work at.

These cards have been approved for use in the State of New York by Mr. Fales, State Supervisor of Industrial Education.

The cards may be punched and kept in a visible record folder or may be conveniently kept in an ordinary filing box.

Teaching High-School Youth to Drive

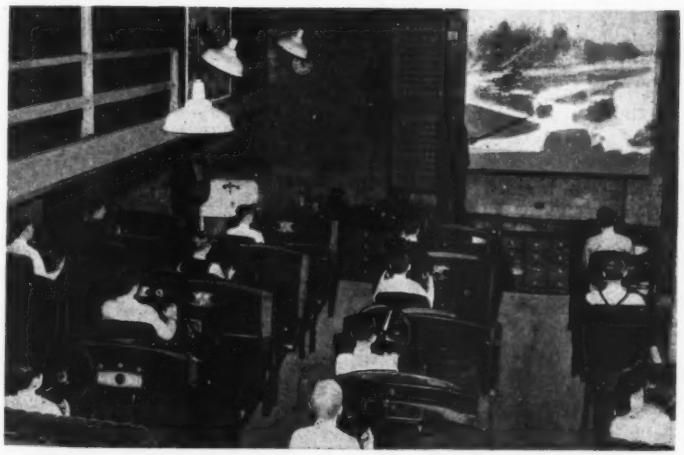
William A. Sears

Supervising Safety Program,
Board of Education,
Chicago, Illinois

A course in safe driving that is producing results.

The Chicago public schools began the pioneering in safety work a number of years ago. As early as 1922, the school-boy patrols began their activities which have shown splendid results ever since. Plays, as well as assemblies, with movies and speakers on safety, have been given for a long time, and with these, and poster and slogan contests, emphasis has been given to the importance of fire prevention and safety in traffic. All these things have helped to make both the elementary- and high-school students more safety conscious.

Early in 1936, Dr. William H. Johnson, the Superintendent of Schools, asked that a program be presented which might be used to teach safe-driving practices to the high-school students. The following plan was accepted and the Lane Technical School was selected as the field of operation because it offered a large cross section of nationalities and the students come from a wide range of family income. Then, too, the Lane School has the largest department for automobile mechanics in which preliminary work could be done. Also, quite an amount of work in safety had been done in this school which was also a factor in its selection.



Explaining driving regulations

Objectives of the Course

The driver's course as planned had these several objectives:

1. To operate with a regular student load per instructor.
2. To operate on a cost basis per student similar to the other shop classes.
3. To do the complete job on school property.
4. To fit it into the regular school program.
5. To make it so foolproof that no student might be injured.
6. To make it a course compulsory for all and not a part of any one department.
7. To have no failures. Each student to continue until he could drive.
8. To keep accurate records of all students' progress so that corrections could be made as needed.

These objectives and the result of a sampling check on some of the students at Lane helped us to determine our course of action and we found varying degrees of driving experience with which to deal.

Getting young drivers accustomed to do the right thing at the right time

The table shown on page 228 gives some idea of the conditions we met:

The sampling was followed with examinations which proved conclusively that all the students, drivers and nondrivers, needed driving instruction.

The driving course as it has developed is in use at the Lane Technical School at the present time. Every student in and above the 2A semester is required to take the course as in that year most of the students are at least fifteen years old, and may meet the requirements for an operators' license in Illinois. One and one half hours a week for eighteen weeks, or one full semester in this work is the requirement and it is in no way connected with or a part of the automobile mechanic's course.

The Course

The time, about 27 clock hours, is divided into three parts or units:

A About six clock hours are spent in studying the generally accepted rules and regulations for the driving of an automobile. This is done with the aid of diagrams and mimeographed

material as well as city and state codes.

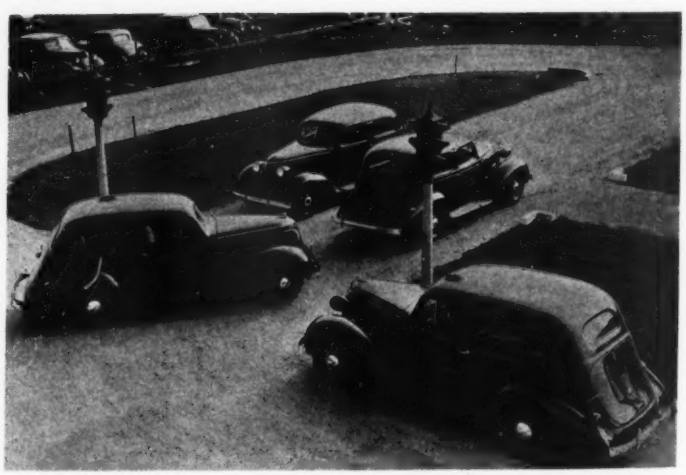
Emphasis is placed upon the relationships which should exist between motorists, pedestrians, and bicyclists as well as operators of other vehicles. The effect of weather on car maintenance, driving operations, general efficiency of the car, and good road manners are studied in this group which operates in the usual classroom manner.

	4A	4B	3A	3B	Mix.	Total	Per Cent
Students who drive in families who drive..	65	236	161	84	106 =	652	.33 plus
Students who do not drive in families who drive	58	140	137	60	128 =	523	.26 plus
Students who drive in families who do not	10	50	23	15	14 =	112	.05 plus
Neither one drives....	79	213	180	90	125 =	687	.34 plus
Total	212	639	501	249	373 =	1974	.98 plus

Explaining the driving mechanism

About seven clock hours are devoted to preliminary instruction on practical driving and practice on control manipulations in dummy cars. Cars cut down to the driver's compartment comprise the equipment of this classroom. The controls, such as the clutch, gas pedal, shifting levers, and brake have all been wired to a panel of lights in the front of the classroom. As the students operate the controls, they complete or break the circuit, and as the lamps light on the panel the instructor may check the achievements or faults of all students.

The work progresses from the proper seating for posture, comfort, and vision to the mastery of the clutch, brake, and gas-pedal controls in turn. The shifting of the gears, the proper placing of the hands on the steering wheel as well as the proper hand signals are taught as progress is made. As the student achieves the mastery of the controls and enough proficiency to operate them all in the dark, he is ready to react correctly to the moving pictures of actual traffic as any driver sees it on the street. In this manner, we simulate actual driving in traffic without the usual hazards involved. The moving pictures used were made by mounting a moving-picture camera in a car and taking pictures through the windshield while driving in traffic. As these pictures appear upon the screen the students operate the controls to meet the situation pictured and the instructor notes their reactions to and judgment in each situation by means of the panel of lights.



Specially constructed driveway for teaching safe-driving habits to young drivers

Thirteen hours have been more than enough in the average case for the actual driving practice on the outside track. Here, also, the work follows a definite line of progress.

Each student is given a card each time he enters the track. This he fills out with what he, himself, observes as to the weather, the condition and operation of the car he is to drive. He starts, drives, and stops the car of which he is the sole occupant. For this practice, we have our own planned and constructed roadway on which traffic lights have been installed, standard curves and grades built, and which is enclosed by a 6-ft. wire fence. Our driver must stay inside, and all prowling youngsters, dogs, stray footballs, and helpful experienced drivers must stay outside. So, the driver himself is able to give all his attention to the very important business of learning to drive. He must assume full responsibility and make and execute his decisions without the help of parent or teacher, perhaps for the first time. There is, needless to say, an instructor on the track at all times but only to check and advise the student when necessary. The track itself is laid out in an area about 270 feet long by 200 feet wide. The longest trip, without repeating, is a little over one tenth of a mile. We believe that experience cannot be measured by miles traveled or years of driving but may be judged better by the things one does when driving under certain conditions at different times. We are trying to plan such conditions and times. In almost two years of operation, we have not had one car collide with another although a few have scraped the fence.

Errors Observed in Student Driving

In the magazine *Today*, November, 1935, Walter Chrysler wrote, "It's up to the driver, and I believe that the most

effective way in which to deal with this problem is through the medium of education."

The problem of which he spoke was the safety problem in driving, and we are attempting to meet that problem through this type of education. We are finding that we must check and recheck the errors and faults of our drivers, and educate against them. During 5,725 student driving hours, we have checked and corrected 3,424 errors in the proper handling of the cars by our students on the track. The following are some of the most outstanding:

Hugs the left side	859
Cuts corners short	460
Improper starting	350
Poor application of foot brake	288
Poor application of hand brake	50
Improper placing of hands on steering wheel	224
Drives too fast for conditions	219
Drives too close to other cars	148
Improper use of keys in ignition and doors of automobiles	117
Use of left door	73
Ventilation	2

The 764 students who claimed to be drivers in our sampling test certainly had some of these errors. In fact, can most of us show a better record? The responsibility is heavy on us all as shown in another sampling we made. In answer to the question, "Who is the best driver with whom you have ever ridden?," 50 per cent of the students named their fathers, the other 50 per cent ranged from mother, brother, sister, relatives, and friends to Barney Oldfield. No one but father rated over 2 per cent. Is that something for fathers to ponder over?

The average time spent by 400 students on the outside track was 12 clock hours and the average mileage was 22.5 miles. The shortest time was 3 hours and the longest 19.5 hours. The shortest distance was 2.6 miles, the longest 51.0 miles. Up to and including June, 1938, we had passed almost 3,000 students through the inside classroom, that is groups A and B, and 400 students had completed both the inside and outside work. Had we had more cars, the number would have been much greater. In all, $300 was spent for gasoline and oil, making the cost per student less than $1. It is my guess from the experience we have had that the total cost *per student of high-school age,* including cost of instructors, equipment, and so forth, would not exceed $3 by using this method of teaching safe driving. The cost would be three or four times this for people 30 years of age, or older. A visit to the Lane School and the driving course would convince the most skeptical of the practical aspect of this type of driving instruction. The students are learning to drive, the cost is not prohibitive, and the area used is not very large. We do believe that this type of educational program will help to reduce the traffic-accident rate.

Practical English for the Vocational Student

John T. Shuman
Williamsport, Pennsylvania

English, as a general related subject, is of basic importance to vocational-industrial pupils. Most of our knowledge is gained through the use of our eyes, and only a comparatively small portion through the medium of our other senses. It follows then that much of our information is gained only as the result of the careful perusal and comprehension of the text matter on the printed page. Whether this page is a printed or written page, a blueprint, or a problem in mathematics, its message is conveyed through the medium of the eye. Hence a certain knowledge of English is fundamentally necessary to interpret properly and to understand clearly the subject matter of our books, magazines, and newspapers. Further, the ability to express oneself clearly and logically is of the greatest importance to any man in any occupation.

But vocational-industrial pupils usually do not like the academic type of English forced on them in so many classrooms. Much of this dislike, of course, is due to the selection of inappropriate subject matter; consequently, the boy makes a poor showing and achieves little in English largely because the traditional presentation of abstract English has no reality for him. It does not come within the scope of either his background or his experience. When pupils of vocational-school age are not thoroughly familiar with and vitally interested in the applications made in the English class, their practice writing and speaking are the result of drudgery and unpleasant work.

English, as a general related subject, should be made as definite and as specific as possible by indicating the practical uses to which the boy can put his knowledge of the language. To this end, the subject matter should be adapted to the interests and the needs of the group. The boy should continue with those phases of the subject which may give him pure enjoyment apart from a practical objective and thus contribute to his so-called cultural background. But aside from such reading as he may do for personal pleasure and enrichment, his study of our national tongue should be just as practical and just as specific as that given an adult workingman.

There are, naturally, a number of important questions which the instructor must answer. His answer to each of these questions will color decidedly the type of material which he presents to the boys under his guidance. Here are a few of these questions:

1. Just when shall we consider that the English taught is practical and specific enough?
2. What kinds of activities in English will give the boy the best equipment for living and for working as a constructive employee and citizen?
3. Will practically applied English result in a greater or lesser achievement than would the usual general course?
4. To what degree will this more or less specific material tend to function in the life of the boy should he enter an entirely different occupational field than that for which he is preparing?
5. Will a more practical and specific type of English activity improve the pupil's attitude toward the subject so that he will be willing to study it harder in its general aspects, thus improving considerably his chances of a higher level of achievement?

Applying English to definite vocational uses.

None of us may agree exactly on our answers to these and similar questions; nevertheless, our answers and the consequent activities presented to the pupils will determine in a large measure their attitudes toward the subject. The pupil's attitude in turn may determine almost entirely his achievement. The answers to the foregoing five questions are reflected in the list of suggested activities which follows. The list may not prove to be the most interesting reading obtainable, but these activities in the various school situations have proved to be infinitely more interesting and valuable than some of the other methods with which we are all too familiar.

Suggested Devices for Making English Practical

1. For oral work make use of items such as the following:

a) Problems in looking for employment.

b) Current economic, legal, and trade problems discussed in trade and technical magazines, as "The Round Table" or "Pop Says" in *American Machinist*, legal points involved in conducting automotive businesses as printed in *Motor Magazine*, etc.

c) Explanations having to do with processes in industry or new developments in business or industry.

2. Giving and writing definite instructions as they are actually given in business and industry.

forms may be included in a letter-writing unit.

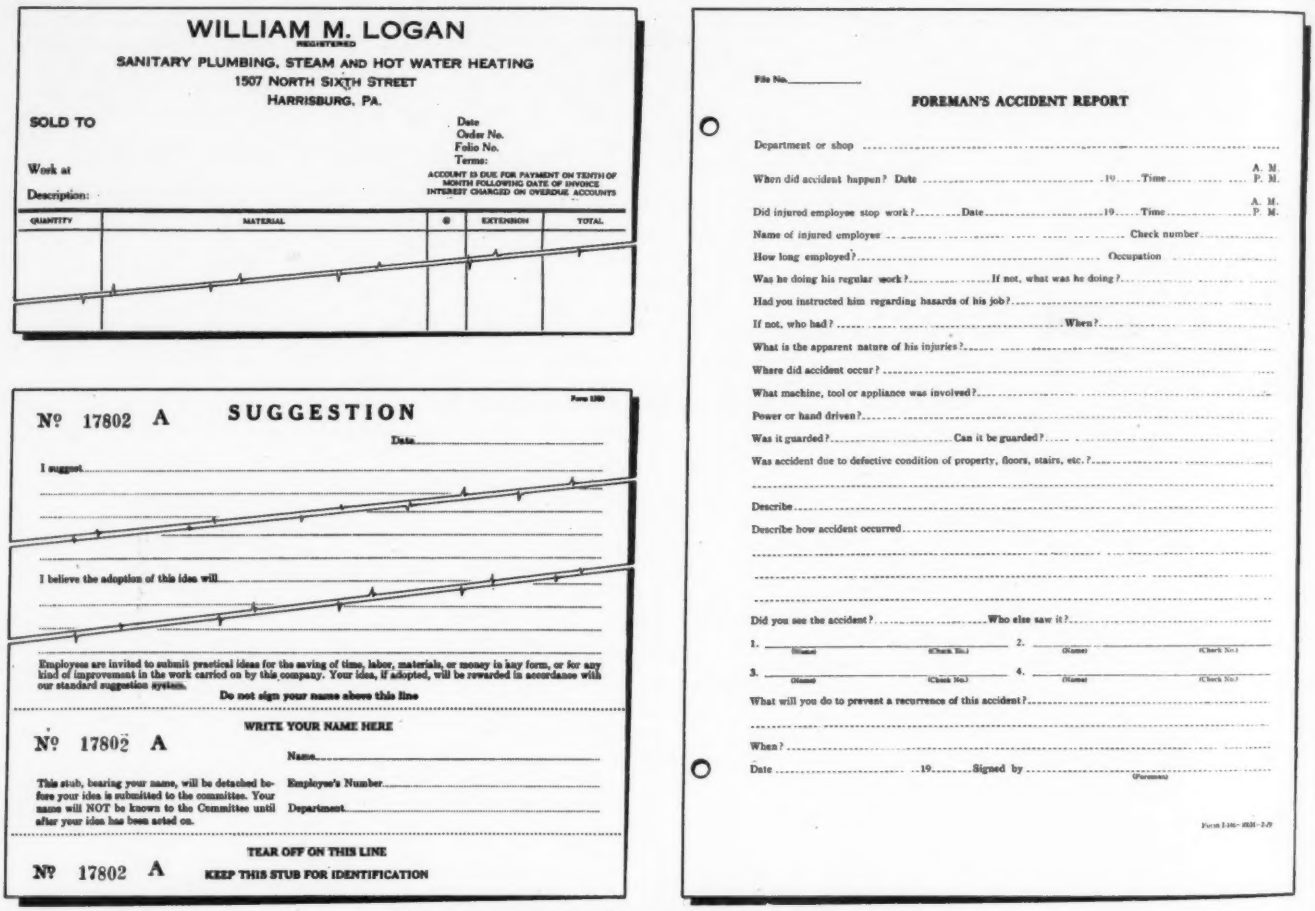
6. Study the advertising of small business, not large ones. Use the advertising of welding shops, service stations, sheet-metal shops, piano tuners, paper hangers, small stores, etc., as examples.

7. Have written work presented in the form of short business and technical reports rather than in the literary type of composition or essay.

8. Teach pupils to report accidents. Use school-shop accident blanks, automobile-insurance-company forms, fore-

sion the following are good: Precise or summary writing; word study, study of contracts and agreements, as apprenticeship contracts, radio and automobile and house leases, used and new equipment contracts, architects' specifications, contractors' and subcontractors' agreements, insurance policies, etc.

12. Dramatize the common rules of courtesy as introductions, taking leave, good and bad procedure on the part of clerks and workmen, then give the pupils a chance to practice these social amenities. Considerable effective social English can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Date
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I believe the adoption of this idea will
Employees are invited to submit practical ideas for the saving of time, labor, materials, or money in any form, or for any kind of improvement in the work carried on by this company. Your idea, if adopted, will be rewarded in accordance with our standard suggestion system.
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File No.
FOREMAN'S ACCIDENT REPORT
Department or shop
When did accident happen? Date ..... 19..... Time..... A. M. P. M.
Did injured employee stop work? ..... Date ..... 19..... Time..... A. M. P. M.
Name of injured employee ..... Check number
How long employed? ..... Occupation
Was he doing his regular work? ..... If not, what was he doing?
Had you instructed him regarding hazards of his job?
If not, who had? ..... When?
What is the apparent nature of his injuries?
Where did accident occur?
What machine, tool or appliance was involved?
Power or hand driven?
Was it guarded? ..... Can it be guarded?
Was accident due to defective condition of property, floors, stairs, etc.?
Describe
Describe how accident occurred
Did you see the accident? ..... Who else saw it?
1. (Name) (Check No.) 2. (Name) (Check No.)
3. (Name) (Check No.) 4. (Name) (Check No.)
What will you do to prevent a recurrence of this accident?
When?
Date ..... 19..... Signed by (Foreman)

Forms that make English more practical to the student

3. Writing bulletin-board notices on subjects pertaining to class- and shopwork of pupils.

4. Writing suggestions to the management about a suggested improvement. A good suggestion well presented often means the difference between promotion and stagnation on routine work. Teach the boys to write suggestions on blanks such as those furnished employees by well-organized local industries.

5. Letter writing. In addition to those letters included in any good English course, teach the writing of letters such as those used to submit bids and to give quotations on work, simple types of sales letters for small businesses, bills, statements, purchase order blanks, and the use of other

man's accident report blanks, etc., for this activity. Use of the actual blanks may be best, but the school printshop might print some, or the boys draw up their own.

9. Inspection reports of school shops, or of plants where co-operative or part-time work is done afford excellent training.

10. Use problem reports for the better pupils. For example, a boy plans to go into the radio business. Have him make a survey of the radio shops already in existence in the local community, what they do, how much business they secure, their locations, etc., and present his information in the form of a regular report. Carrying through a project of this kind is excellent all-round training.

11. For developing reading comprehen-

be taught if you have an opportunity to supervise a dancing class for those who wish to learn to dance. Home-economics girls can serve dinners to groups of boys who in turn plan the entertainment.

13. An inexpensive public-address system will help increase interest in oral English. Over it you can dramatize conversations heard on the street corners, give lectures and have the pupils take notes much as they might in their own homes over the radio. Study how to listen as well as how to read and how to speak. Remember that many of these pupils will be followers rather than leaders in our society.

14. Utilize the panel-discussion technique in preference to formal debate work. Boys tend to open up and talk about

things that interest them when engaged in a lively panel discussion.

15. Keep available at all times in the English room a number of trade and technical as well as other magazines. Encourage their use.

16. Shop instructors can have office boys keep records, type letters, answer the telephone, keep attendance, etc. One boy may be assigned this job for a definite period and his work constructively criticized during that period.

17. Visual-education devices promote interest — charts, graphs, pictures for explanation, etc. Motion pictures should be used in the English classroom; for example, the Eastman film on the four-cycle internal-combustion engine provides excellent material in oral explanation in the English class.

18. Shop teachers and related-science teachers can furnish lists of pertinent report and theme subjects.

19. Parliamentary procedure may be studied and practiced. In connection with this, the writing of minutes and the keeping of club records is an excellent activity.

20. The newspaper is a good medium for much vital and interesting reading and study.

Educational Content and Industrial-Arts Projects

F. C. Finsterbach

South Park High School,
Buffalo, New York

In discussing this topic, the first thing that needs to be done is to define the word *project* in order to establish the sense in which it is to be used.

The word *project* in its educational sense means a *wholehearted purposeful activity*. This is exemplified in the type of activity found in the lower grades in the setting up of a grocery store which might include writing to manufacturers for samples, visits to the local stores for prices, making of problems in arithmetic, and buying and selling across the counter — the whole being called a *project*.

The U. S. Government has used the word in this sense in its WPA program whereby certain activities were called projects and given a number. These projects entailed the planning, buying of materials, the building of necessary roads and in many cases, the establishment of towns to house the workers on the project.

It remained for the industrial-arts people to narrow the term *project* to the point where it hardly casts a shadow of its true significance. We dignify a match scratcher with the name *project* and refer to the making of stage property, as *extraneous work*, whereas the situation might call for an exact reversal of terms.

We have a tendency to ignore the *purpose* and to place our emphasis upon the *activity* only. In far too many cases has the student completed an article, wholly ignorant of the nomenclature and the characteristics of the material used, the processes they possibly went through before he received them, their cost per unit, and further details which might have converted his *model* into a *wholehearted purposeful activity*.

Recognizing that real industrial-arts work embraces more than the production of projects.

Of course, the easiest, and, unfortunately, the most popular way is to allow the students to make things unhampered by so-called related work. Courses taught in this way naturally do *not* carry out the pur-

Learning Units	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Percentage of learning units involved	Rearrangement of units based on percentage of demand	Frequency of occurrence
	Airplane--scale model of U. S. Army "Hawk"	Airplane--turned fuselage and wheels	Explosive ship and cannon (mousetrap power)	Steam engine (see Metal also)	Tap dancer (loose-joint feet)	Motorboat	Sailboat	Door stop	Footstool	Sewing kit	Tool chest	Water turbine (see Metal also)	Peg game	Ash stand	Bird house	Electric motor (see Metal and Electricity)	Sleeve board	Shine box	Plant stand	End table	Taboret	Book shelf	Corner shelf	Sewing cabinet			
1. Read a drawing			✓	✓			✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	.70	7	17
2. Make bill of material	✓	✓	✓	✓		✓	✓		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	.79	5	19
3. Plan procedure	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1.00		24
4. Check material	✓	✓	✓	✓		✓	✓	.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	.85	3	21
5. Measure with rule			✓	✓	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	.85	3	20
6. Lay out pattern	✓	✓	✓			✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	.83	4	20
7. Check layout	✓		✓			✓	✓		✓			✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	.85	3	16
8. Compass or dividers			✓		✓		✓		✓	✓		✓		✓		✓	✓	✓	✓	✓	✓			✓	.62	9	15
9. Pencil gauge	✓	✓	✓	✓		✓	✓		✓				✓	✓		✓	✓	✓	✓	✓	✓			✓	.62	9	15
10. Use marking gauge			✓	✓		✓	✓		✓		✓			✓		✓	✓	✓		✓	✓	✓		✓	.66	8	16
11. Test with square			✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	.79	5	19
12. To lay out with square			✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	.75	6	18
13. Adjust jack plane			✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	.75	6	18
14. Adjust block plane	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	.75	6	16
15. Plane surface		✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	.91	2	22
16. Plane edge	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	.95	1	23
17. Plane end grain			✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	.79	5	19
93. Cut edge mold			✓°	✓°						✓°		✓°					✓°			✓	✓°	✓°		✓°	.37	15	9
94. Do upholstery weaving									✓																.04	24	1
95. Sharpen edge tools	✓	✓	✓	✓		✓	✓		✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	.79	5	19
96. Sharpen screw driver				✓			✓					✓		✓			✓		✓						.25	13	6
97. Sharpen scraper										✓										✓	✓	✓		✓	.25	18	6
98. Sharpen auger bit			✓						✓																.08	23	2
99. Sharpen saw																									0.00		
100. Protect tools from rust	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	1.00		24
101. Set & use expansion bit															✓										.04	24	1
102. Use Forstner bit							✓		✓			✓										✓			.16	21	4
103. Care for spray gun																		✓	✓	✓	✓	✓		✓	.25	23	6
°Variable X Common — total units	23	24	43	34	14	43	56	21	60	31	44	30	25	47	37	38	47	56	51	72	71	52	50	70			

Fig. 1. The teacher's analysis

poses of industrial arts as defined by educational leaders, and as paraphrased in every available course of study. Have teachers, then, become so entranced by the practical activity side of our work that the *how* has overshadowed the *why* and *wherefore?* Some teachers even boast that they "never bother with related work, because" they say, "it is not pleasing to the boy, detracts from his interest, and interferes with his practical work."

Such statements are confessions of lack of training, or a misconception of the purpose of industrial arts or a subscription to the sugar-coated variety of educational philosophy which is sending so many of its graduates to the *higher* educational courses in reform schools and penal institutions.

If education attempts to fit the school to the child to such an extent that his pleasure alone becomes the criterion of what shall or shall not be taught, then the oft-quoted character-training purpose will become a hollow mockery, and there will be need to double the police force which will care for the future citizen who now does as *he* pleases.

If it is true that man appreciates those things which cost him the greatest effort, if industrial arts hopes ever to make its work fully appreciated and wholly beneficial, then it may become necessary to rub off some of the sugar coating to reveal the content, however bitter it may seem to the pupil. Teachers of industrial-arts subjects must have the conviction that they are making a definite contribution to the character and general well-being of the boy and that they are doing their part to curb the outbreak of moral measles in the youth of today.

One need not go to the ridiculous extreme of recommending that interest or individual need be not recognized at all, but it must be made clear that educational content, after all, has a place in industrial-arts work and should be a major control in its presentation.

(Exhibit B)

PLAN SHEET

Industrial Arts

Model _____

Name _____ Class _____ Date started _____

In making this model, I will work in the following industrial divisions: _____, _____, _____, _____, _____, _____.

I plan to use the following materials:

Name of part	Number Required	Kind of material	Thickness	Width	Length	(or) Wgt	Unit Price	Cost
Formula: Cost						Total cost		

Related topics that go with this model:

	check		check
1. _____		6. _____	
2. _____		7. _____	
3. _____		8. _____	
4. _____		9. _____	
5. _____		10. _____	

Examined by _____ Clerk — Total time used _____ hrs.

Instructor's O.K. _____ — Date finished _____

The student's plan sheet

With this in mind, it is well to determine the educational content of the project (with project taken in its larger sense), to mean the model or object together with all the concomitant knowledge, appreciations, attitudes and habits resulting from the planning and constructing of the model.

One method that is used, frequently with some success, is to analyze the model with respect to the learning units involved. Any list of units indicated by a good course of study will suffice. The units may be listed in a vertical column and the models spread out in a series, horizontally, and cross checked for each learning unit involved in each model. (See Fig. 1.) In this way, it is possible to determine the *relative weight* of the model in terms of the units. When the various weights are found, the units or topics are entered in the *plan* sheet and worked out along with the model.

Most teachers pick out models which tend to fit the basic operations and other learning units in the course of study, but the danger lies in the probability that once having picked the model in order to give effect to the units, the units are then lost sight of and the object becomes an end in itself rather than a means to an end.

It is this that ought to be prevented. The student ought to be conscious that through the medium of his model he is to learn valuable facts about the industrial life of our nation which will tend to make him a more intelligent consumer and a tolerant and useful citizen.

He should be continuously aware of the fact that while the article he is making may fill a present personal or family need, the primary purpose of the work is educational and instructive rather than utilitarian.

To establish this definitely is very necessary. The rise of the so-called progressive movement, activity methods, and so forth, has been due, in a large measure to the failure of the industrial-arts teacher's insistence that educational content, other than operations and processes, be made an important part of his work.

Other fields have apparently taken over part of the functions of the industrial-arts work. If this continues, administrators may well decide that they can do without shops that are dedicated to *production* rather than to education.

CHECKING LIST FOR CLOSING INDUSTRIAL-ARTS SHOPS

H. L. Stiles, High School, Nogales, Arizona

1. Is there an inventory of tools and machines? ....
2. Is there an inventory of supplies? ....
3. Is there an inventory of reference books, magazines, pamphlets, which belong to the school? ....
4. Is there a list of tools broken or lost during the school year? ....
5. Are the hand tools stored in a safe place for the summer? ....
6. Have the tools that are subject to rust been cleaned and greased? ....
7. Are the unfinished projects stored in lockers? ....
8. Have all moneys been turned in? ....
9. Is there a statement showing accounts unpaid at the close of the year? ....
10. Are the supplies on hand stored in places where they cannot be tampered with during the summer? ....
11. Have measures been taken to remove all fire hazards, such as scraps of wood, waste containers, oily rags, etc.? ....
12. Is there a provision made for placing some responsible person in charge of the tools and machines during the summer? ....
13. Have all school keys been returned to the office? ....
14. Has the office your summer address? ....

Diligence is the mother of good luck, and God gives all things to industry. Work while it is called today, for you know not how much you may be hindered tomorrow. One today is worth two tomorrows; never leave that till tomorrow which you can do today. — *Benjamin Franklin.*

Industrial Education in Senior and Vocational High Schools

M. S. Olsen

Supervisor Vocational Rehabilitation, Public Schools, Minneapolis, Minnesota

The minimum entering age into industry has climbed from sixteen years in 1929 to nineteen years in 1938. Because of this fact, the high schools are crowded with boys from sixteen to nineteen who normally would be at work. These boys naturally seek industrial training, since industrial jobs are not available. To provide such training, industrial-arts courses in senior high schools must be revised to cover definite fields of industry, while the vocational high school concerns itself with others.

It is therefore, recommended that senior high schools offer fundamental training in three major fields of building construction, electricity, and mechanical processes, thus permitting the boy to select one field in which he will receive three years of comprehensive training in preparation for employment in said field.

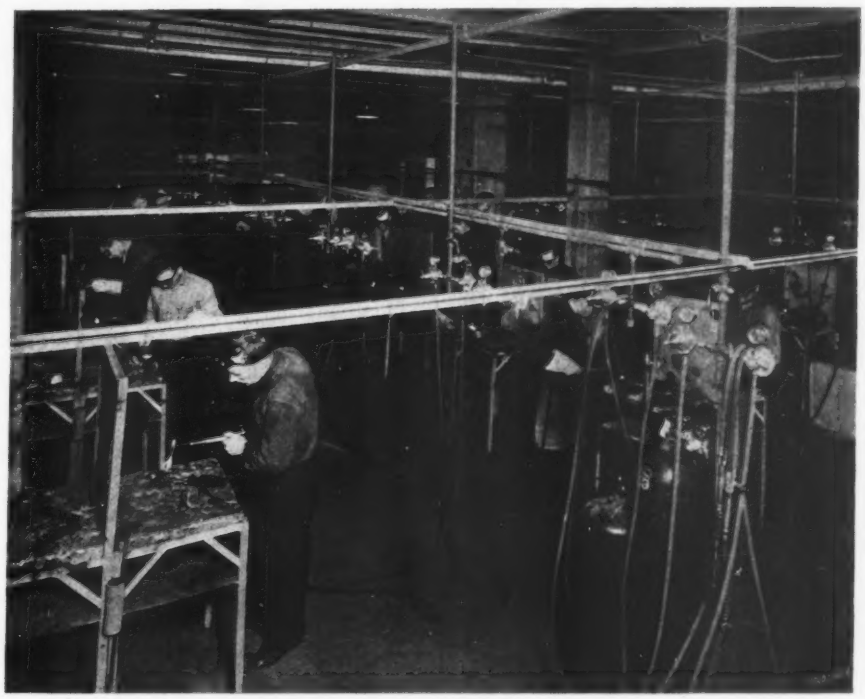
It is also recommended that vocational high schools offer three years of fundamental training in miscellaneous fields, with no intrusion into the three major fields already mentioned. Selected fields should be rich enough in content to furnish three years of comprehensive training. Printing, auto repairing, and tailoring are suggested. Other fields requiring less than three years of training should be left to evening schools, adult education, or commercial training agencies.

Vocational-high-school graduates, in common with senior-high-school graduates, are expected to seek apprenticeships in some specific occupation in the fields in which they have been trained.

The following pages show revision of industrial courses in senior high schools, covering the three major fields of (1) building construction, (2) electricity, and (3) mechanical processes; also one of the vocational-high-school courses in miscellaneous fields; namely, auto repairing.

Shop layouts, shop equipment, and shop supplies are of immediate practical concern in the consideration of the foregoing program. In the senior high school, it is quite evident that the required building-con-

Shop courses that should be offered in the two types of high schools.



Acetylene welding should be offered only in vocational high schools as a part of the auto-mechanics course. (Photo courtesy of Dunwoody Institute, Minneapolis, Minnesota)

Building Construction Course in Senior High Schools

GRADE 10

For College Entrance		*For Trade Entrance*	
Required	*Periods*	*Required*	*Periods*
English	5	Related English	5
Mathematics	5	Related mathematics	5
Shops: Carpentry I	10	Shops: Carpentry I	10
Carpentry II		Carpentry II	
Gymnasium and chorus	4	Architectural drawing	10
		Gymnasium and chorus	4
Electives		*Electives*	
History	5	History	5
Language	5	Language	5
Architectural drawing	10		

GRADE 11

Required	*Periods*	*Required*	*Periods*
English	5	Related English	5
Mathematics	5	Related mathematics	5
Shop: House wiring	10	Shop: House wiring	10
Sheet metal		Sheet metal	
Air conditioning		Air conditioning	
Gymnasium and chorus	4	Architectural drafting	10
		Gymnasium and chorus	4

For College Entrance		*For Trade Entrance*	
Required	*Periods*	*Required*	*Periods*
Electives		*Electives*	
Physics	7	Physics	7
Language	5	Language	5
History	5	History	5
Architectural drafting	10		

GRADE 12

Required	*Periods*	*Required*	*Periods*
English	5	Related English	5
Mathematics	5	Related mathematics	5
Shop: Bricklaying	10	Shop: Bricklaying	10
Painting		Painting	
Gymnasium and chorus	4	Architectural drafting	10
		Gymnasium and chorus	4
Electives		*Electives*	
Chemistry	7	Chemistry	7
Civics	5	Civics	5
Language	5	Language	5
History	5	History	5
Economics	5	Economics	5
Architectural drafting	10		

Electrical Course in Senior High Schools

For College Entrance		*For Trade Entrance*	
GRADE 10			
Required	*Periods*	*Required*	*Periods*
English	5	Related English	5
Mathematics	5	Related mathematics	5
Shop: Wiring I Wiring II	10	Shop: Wiring I Wiring II	10
Gymnasium and chorus	4	Mechanical drawing	10
		Gymnasium and chorus	4
Electives		*Electives*	
History	5	History	5
Language	5	Language	5
Mechanical drawing	10		
GRADE 11			
Required	*Periods*	*Required*	*Periods*
English	5	Related English	5
Mathematics	5	Related mathematics	5
Shop: Direct current I Direct current II	10	Shop: Direct current I Direct current II	10
Gymnasium and chorus	4	Mechanical drawing	10
		Gymnasium and chorus	4
Electives		*Electives*	
Physics	7	Physics	7
Language	5	Language	5
History	5	History	5
Mechanical drawing	10		
GRADE 12			
Required	*Periods*	*Required*	*Periods*
English	5	Related English	5
Mathematics	5	Related mathematics	5
Shop: Alternat. current I. Alternat. current II	10	Shop: Alternat. current I. Alternat. current II	10
Gymnasium and chorus	4	Mechanical drawing	10
		Gymnasium and chorus	4
Electives		*Electives*	
Chemistry	7	Chemistry	7
Civics	5	Civics	5
Economics	5	Economics	5
Language	5	Language	5
History	5	History	5
Mechanical drawing	10		

Mechanical Course in Senior High Schools

For College Entrance		*For Trade Entrance*	
GRADE 10			
Required	*Periods*	*Required*	*Periods*
English	5	Related English	5
Mathematics	5	Related mathematics	5
Shop: Pattern Foundry	10	Shop: Pattern Foundry	10
Gymnasium and chorus	4	Mechanical drawing	10
		Gymnasium and chorus	4
Electives		*Electives*	
History	5	History	5
Language	5	Language	5
Mechanical drawing	10		
GRADE 11			
Required	*Periods*	*Required*	*Periods*
English	5	Related English	5
Mathematics	5	Related mathematics	5
Shop: Pattern Foundry	10	Shop: Pattern Foundry	10
Gymnasium and chorus	4	Mechanical drawing	10
		Gymnasium and chorus	4
Electives		*Electives*	
Physics	7	Physics	7
Language	5	Language	5
History	5	History	5
Mechanical drawing	10		
GRADE 12			
Required	*Periods*	*Required*	*Periods*
English	5	Related English	5
Mathematics	5	Related mathematics	5
Shop: Machine I Machine II	10	Shop: Machine I Machine II	10
Gymnasium and chorus	4	Mechanical drawing	10
		Gymnasium and chorus	4
Electives		*Electives*	
Chemistry	7	Chemistry	7
Civics	5	Civics	5
Economics	5	Economics	5
Language	5	Language	5
History	5	History	5
Mechanical drawing	10		

Auto-Mechanics Course in Vocational High Schools

For Trade Entrance

GRADE 10

Required	*Periods*
Related English	5
Related mathematics	5
Related science	5
Shop: Chassis Engines	20
Gymnasium and chorus	4
Electives	
None	

GRADE 11

Required	*Periods*
Related English	5
Related mathematics	5
Related science	5
Shop: Ignition Welding	10
Gymnasium and chorus	4
Electives	
None	

GRADE 12

Required	*Periods*
Related English	5
Related mathematics	5
Related science	5
Shop: Garage I Garage II	20
Chorus and gymnasium	4
Electives	
None	

struction shops, with the minor exception of sheet metal, are all hand-tool equipped, thus removing the usual equipment-cost objection on the part of taxpayers. The electrical shop in d.c. and a.c. requires both machinery and equipment but, this once installed, will be just as permanent as the present equipment in our standard physics laboratories. The mechanical shops, with the exception of the foundry, are already established in schools with industrial-arts courses. Such courses, however, are in dire need of revision if these shops are to function efficiently in preparing boys for entrance into mechanical industry. No doubt, some revision in shop machinery and tools would accompany the revision of the courses. From an administration point of view, the machine shop has always been a source of irritation because machine-shop teachers in general have been trying to keep up with industry which is always confronted with rapid changes in production machinery. The senior high school should forget production, and confine itself, instead, to teaching the fundamental principles underlying the mechanical trades, thus eliminating, once and for all, the word *obsolete* insofar as machinery and equipment are concerned.

Vocational-high courses should be measured with the same yardstick of economy

(Continued on page 236)

INDUSTRIAL ARTS and VOCATIONAL EDUCATION

J. J. Metz, Editor

Civic Responsibilities

One of the objectives which every teacher must keep foremost in his mind is the need for showing the student how to apply the things which he has learned, to the various situations as they arise in life. Instructors in the fields of industrial arts and vocational education are more fortunate than many of their brethren, because shopwork presupposes a close tie-up with practical application. Probably it is for that reason that so many students go to their shop instructors for advice on out-of-school affairs rather than to the teachers whom they have in other subjects. For this reason also, this editorial calls attention to a matter which does not fall strictly into the shop teacher's field, yet, because of his influence with his boys, he can do much by giving them a few pointers that may stand them in good stead not only during the coming summer months but throughout their entire lives.

That instruction of this kind is very necessary is illustrated forcibly by the report made recently by the superintendent of parks in a city of approximately 550,000. In this report, the superintendent states that it costs the city about $100,000 annually to pay for the fun of boys and men gifted with a perverted sense of humor. He mentions the following specific cases: In one of the parks, extensive changes were to be made. This necessitated the draining of a lagoon. In the mud at the bottom of the lagoon were found a dozen or more park benches which had been reported as stolen. Someone had been having fun tossing them into the water.

In another park, 24 outdoor fireplaces had been provided for the picnickers. These fireplaces were in use but one summer, for during the following winter all but three were destroyed. It must have given the vandals who perpetrated this piece of hoodlumism quite a bit of work to tear the iron grill and stonework apart, but evidently the destruction of a $100 fireplace was worth the trouble.

Another expensive item of damage was created by a gang of nitwits who plugged a sewer outlet of a park skating shelter. The sewer backed up, flooding the basement of the shelter and making the structure unusable for several weeks. In this same park, someone with a warped sense of humor chopped away the supports of several rustic bridges. Probably the fact that the replacement of these bridges prevented the use of certain paths through the beautiful park for some weeks during the summer season gave zest to those who worked so hard at demolishing the supports.

Another item stated that the stone pedestal of a huge bronze statue had been daubed with tar, the last remnants of which the workmen had not as yet been able to remove. Walls, too, are commonly defaced with pencils, crayons, pens, and lipstick, the last mentioned being in many instances the most difficult to remove.

Windows, too, seem to offer targets that cannot be resisted. Faucets must be wrenched off, soda fountains overturned and smashed, electric-light bulbs shattered — all to satisfy a sense of humor that is hard to understand. Add to the foregoing the damage done by lighted cigarettes carelessly laid on arms of chairs, edges of tables, and window sills, and it becomes apparent that teaching our youth how to apply common sense in the use of public property will not only be a service to the community, but also to the individual who has not learned that his silly pranks are actually taking money out of his own pocket.

Prizes and the Annual Exhibit

This is the time of the year when some school teachers are confronted with the delicate task of choosing the valedictorian and other members of the graduating class to whom special honors are to be shown. While this task does not usually fall on the shoulders of the shop teacher, he may be confronted with the job of choosing from among his students those who deserve prizes for exceptional craftsmanship. Unfortunately, the practice of giving such prizes is not as widespread as it ought to be.

The student who receives such an award for meritorious work, naturally gets a great deal of satisfaction out of it, but the very offering of the prize is an inducement for every member of the class to try his best to excel. A real urge, not merely to do good work, but to turn out work that might merit the term *excellent* is thus given.

Almost every community has civic-minded people who will furnish one or more suitable prizes for purposes of this kind. The prizes need not be expensive, but they should be marked, stamped, or engraved, so that they may be perpetual reminders of the honor achieved. It is well also to have the prizes in the form of merchandise that will be useful to the boy rather than in the form of cash. If merchandise prizes cannot be obtained, ribbons may be awarded.

The distribution of the prizes should be made at a public function, probably even at the graduation exercises, or they may be offered at the end of an exhibit of the year's shopwork. These exhibits are extremely valuable not only for showing what the students have accomplished, but to acquaint the parents and public with what is offered by the school.

Of course, it may be too late to plan a public exhibit for this year, but a start can be made by holding a one-day exhibit in the shop itself, inviting a few craftsmen to act as judges, and distribute some prizes. For the next school year, the exhibit may then be planned as a regular part of the shop activities.

Planning for the New School Year

With vacation time approaching, it may be well for the shop teacher to spend a little time in making an analysis of the things which he ought to do this summer to improve his work during the next school year. The following list is added merely because it may be helpful in setting up such an activity program.

1. List the changes that must be made to the present outline of instruction; to the instruction, operation, and assignment sheets; the progress chart; the personnel assignment chart; and the display charts and illustrative material that has been used during the past year.
2. Do whatever can be done to bring the aforementioned to such a point that they may be used on the first school day next September.
3. Make some shop trips to study new developments.
4. Make an industrial survey of the home town or of some neighboring city.
5. Study the school-shop layout to see whether teaching and learning conditions may be improved.
6. Check carefully that everything is in order for the first class period in September.

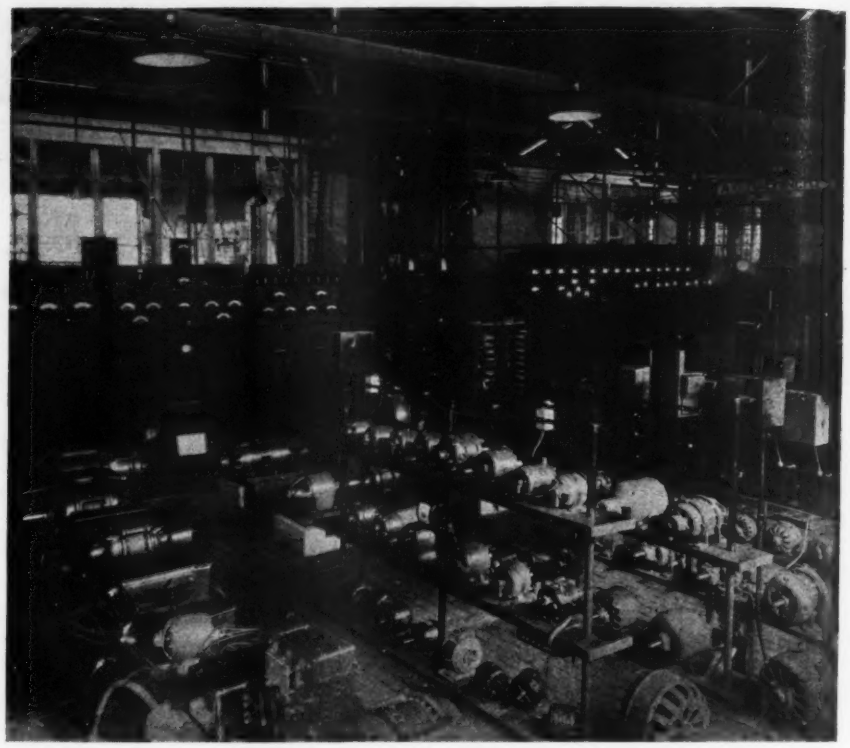
(Continued from page 234)

and permanency as are the senior-high courses for, in the final analysis, federal aid is nothing more or less than local taxpayers' money.

Vocational high schools differ in general from senior high schools in two respects: First, by offering twice as much shop time as do the senior high schools and second, by offering training in *special* fields, such as printing, auto repairing, furniture manufacturing, and custom tailoring.

If the latter difference were kept clearly in mind at all times, there would be no duplication in the vocational high schools of shops and courses which belong in the senior high schools.

To inaugurate the proposed changes in the industrial-arts program of senior high schools is a comparatively simple task, thanks to both private and public vocational schools which have flourished in this country since the passage of the Smith-Hughes Act in 1918. There are many of these schools scattered throughout the nation. These will gladly furnish shop layouts, and information about needed equipment, supplies, texts, and job sheets in such courses as carpentry, house wiring, sheet metal, bricklaying, painting, d.c. and a.c. electrical courses, patternmaking, foundry practice, and machine shop. The various editions of *Bruce's School Shop Annual* also contain much usable material along these lines.



An a.c. machinery and equipment shop belongs in the senior high school as a part of the electrical course. (Photo courtesy Dunwoody Institute, Minneapolis, Minn.)

Course of Study in Industrial-Arts Cabinetmaking—I

W. H. Bowers

Supervisor Industrial Arts,
High School,
Tuckahoe, New York

This is the first part of the outline of study.

This course of study was used in the 10th, 11th, or 12th grades in the high school at Tuckahoe, N. Y., as a unit course in cabinetmaking. It contains sufficient subject matter for two years' work, on a basis of five periods per week in the shop, and sufficient outside preparation to fulfill the state requirements as they are now outlined.

Tuckahoe is a residential community in Westchester County, but a large majority of the students are from the *middle class* of people from the village itself. Most of the students are very much interested in the shopwork, although it is an entirely new experience to them, as 99 per cent of them have never had any previous training in shopwork. There are no manufacturing industries in the town whatsoever.

A course in general shop is pursued by the boys in the 7th, 8th, and 9th grades, most of whom spend approximately two 45-minute periods per week therein. This work consists of woodwork, electricity, sheet metal, and art metalwork, and some machine-shop practice. The senior-high-school boys were allowed to elect cabinetmaking and mechanical drawing for regents' credits. The shop is equipped as follows: Four double woodwork benches with all necessary hand tools, band saw, circular saw, jointer, grinder, wood-turning lathe and glue bench. The shop also has an electrical bench of three sections, each of which is supplied with a small panel for wiring.

A stake bench and several small machinist's benches, including sufficient necessary equipment to carry on metalwork in a small way, is also included in the shop.

Processes and Operations

Measuring, planing, squaring, sawing (crosscut, rip-, back-, coping, compass, and turning saws), sandpapering, chiseling, gouging, boring, fastening (nails and screws), countersinking, inserting hinges, gluing, clamping, dowel joint, half-lap joint, mortise-and-tenon joining, miter joint, rabbeting, routing.

Machine Work and Finishing

Lathe, wood turning; *grinder,* sharpening tools and implements; *band saw,* sawing irregular surfaces, resawing, miter cutting; *circular saw,* ripping, crosscutting, resawing, dadoing; *jointer,* surfacing face and edge, taking wind out of stock, rabbeting; *finishing,* puttying, waxing, shellacking, staining, filling, varnishing, painting, enameling, rubbing, polishing; *upholstering.*

Tools and the Things the Pupil is to Do with Them

Rule, for measuring distances; *marking gauge,* for marking off widths with head of gauge held against the working edge;

knife, to be used when squaring up end of stock in conjunction with the try square; *crosscut saw,* to be used when sawing across the grain of wood; *ripsaw,* to cut wood with the grain; *backsaw,* to cut wood across grain; *jack plane,* adjust plane surfaces, plane working face, plane working edge, plane ends; *block plane,* square up ends of small piece of stock; *brad awl,* make small holes; *screw driver,* insert screws in wood; *chisel,* pare wood, cut mortises, chamfer arrises; *hammer,* drive nails, brads, tacks, etc.; *nail set,* drive nails into wood so that their heads may be concealed with putty or some other similar preparation; *bar clamp,* to hold glued edges together; *brace and bits,* to drill holes in stock; *gouge,* to cut out, hollow, or excavate a surface; *bevel,* to lay out angles; *framing square,* to square up or test large pieces of stock; *turning saw,* to cut curved or irregular surfaces heavy stock; *spokeshave,* to form curved edges; *rabbet plane,* to plane rectangular grooves in wood; *compass saw,* to cut circular or irregular edges; *dividers,* to lay out curves or circles on wood; *coping saw,* to cut curved or irregular surfaces; *scraper,* to scrape surfaces of wood; *countersink,* to enlarge end of hole so that flathead screwheads will come flush with surface; *burnisher,* a tool used for polishing surfaces; *files,* hard-steel smoothing instruments used to smooth up edges of stock; *gluepot,* for heating glue; *hinges, locks,* and *hardware,* used as needed; *angle irons,* fastened to wood to hold different members in place; *dowels,* round pieces of wood glued into holes to form a joint; *steel wool,* used same as sandpaper; *band saw,* circular work, irregular work, key sawing, resawing, bevel sawing; *circular saw,* ripsaw work, crosscut work, mitering, rabbeting, resaw work; *jointer,* facing, jointing edges, taking wind out of stock; *wood-turning lathe,* chuck turning, straight turning; *grinder,* sharpening tools, materials, and supplies to be used, and how they are used; *screws,* flathead, bright, roundhead, blued; *glue,* hot or cold, applied with brush to the edges to be jointed and held together with clamps or hand screws; *cup hooks,* screw into keyboard to hold keys in place; *putty,* used to fill holes in wood; *shellac,* applied with brush to finished surface, used as a first coat; *alcohol,* to clean shellac brushes and to reduce consistency of shellac; *wax,* applied over a stained surface as a permanent finish with rag or piece of waste; *varnish,* applied with brush on surface that has been thoroughly sandpapered; *pumice,* mixed with water to rub down a varnish finish to give a dull effect; *rottenstone,* same as pumice; *turpentine,* to reduce varnish, paint, or enamels to a uniform consistency, to clean brushes or remove paint; *enamel,* applied with brush to smooth surface, like shellac or varnish, to give permanent finish.

Types of Construction

Jobs involving the use of bench tools — the butt joint; the glued joint; half-lap joint; curved surface; dowel and mortise-and-tenon joint; drawer construction; machine work; finishing; upholstering.

Related Material

Design. Student encouraged to plan own design for projects and furniture, design to be submitted to instructor for approval. Emphasize proper setting, and period styles of furniture.

Blueprint Reading and Shop Sketching. Theory of orthographic projection, two or more views; practical system of lettering (inclined letters at a 60-deg. angle); a good freehand sketch, suitably lettered to be handed to the instructor before the student attacks easy problem.

Mathematics. Board measure; bill of material for every job on form provided by the instructor; furniture cost.

Science. Methods of seasoning lumber; changes in lumber while being seasoned; cause and precaution of warping; good contact and pressure necessary in gluing stock, composition of glue and the importance of using same while hot; relative strength of joints; relative strength of different kinds of wood; expansion and contraction of wood; principle of friction applied in driving saws; discuss difference in shape of teeth of saws; discuss principle of running water on grinder; properties of shellac; paint, stain, varnish, lacquer.

Occupational Information. Study the following industries as to wages, working conditions, advancement: Lumbering, cabinetmaking, patternmaking, carpentry, wood finishing, automobile industry (as pertaining to woodwork), airplane industry.

Selection, Use, and Care of Products. How to tell veneer from solid wood, especially in fine furniture; why it is unwise to select or purchase cheap paints, varnishes, and brushes; selection of certain types of furniture for different purposes; all pieces of a set should harmonize; selection and care of tools to be used about the home.

Use of Tools and Materials.[1] Use of hand tools, Chapter I; use of machine tools and machines, Chapter II; the sharpening of tools, Chapter III; wood-turning tools, Chapter XIII; wood finishing, Chapter XVI; surface decoration, Chapter XIV; upholstery, Chapter XV; selection and uses of lumber, Chapter XVII.

Geography of Transportation of Materials and Products.[2] Botanical division of trees; life function of trees; conservation of lumber; wood structure; cell formation; annual rings; heartwood and sapwood; cambium; bark; medullary rays; porous woods; weight of wood; tree reproduction; logging operations from the factory to the mill; seasoning of wood; air seasoning; kiln seasoning; moisture content; types of kilns; drying defects; manufactured lumber; how lumber is handled and shipped; foreign lumber.

[1] *Principles of Woodworking,* Hjorth, Bruce Publishing Co, Milwaukee, Wis.
[2] *Ibid.,* Chapter XVI and XVII.

(To be continued)

Problem Solving in Architectural Drawing

R. M. Hammes
Abraham Lincoln High School, Council Bluffs, Iowa

Teaching the student to plan, make decisions, and to solve problems, must be the aim of all real teaching.

For some years, the pupils of Abraham Lincoln High School, Council Bluffs, Iowa, have been outstanding in the field of high-school drafting. First or second places have been won each year in the national competitions since inception in 1933. All first-place awards in the Iowa drafting contests have been won by the school since 1927. It is the belief of the author that such unusual accomplishment over a period of years is due to the use of the problem-solving method of instruction used as soon as the pupil acquires a knowledge of the fundamental principles of mechanical drawing.

The first semester of the pupil's work is given to the study of the fundamentals of mechanical drawing. He may then elect what course he will follow the second semester. The second semester, if architectural drawing is elected, is given to the study of the history of architecture, to freehand sketching, and to the styles in architectural design. Considerable use is made of the balopticon in this work.

After the fourth semester, a pupil is quite free to exercise his fancy in selecting the problem. Some have chosen the planning and design of office buildings or libraries, others have taken that of schools, churches, mausoleums or other memorial structures, and some have worked on hotel plans. Models may be made in cardboard, clay, or cast in plaster.

In the solution of the problem the pupil must interview librarians, realtors who handle rentals of office buildings, pastors of churches, hotel managers, even casket manufacturers in the design of a mausoleum, and others who may give them sug-

gestions in the planning of their structure. Such interviews not only present real life problems and obstacles to overcome, but give an array of information from which the pupil must select the most pertinent.

A typical problem of the third semester (architecture) requires the student to design a convenient, substantial, and attractive five-, six-, seven-, or eight-room house of masonry or frame construction. The site is assumed to be a suitable lot with a frontage of 50 ft., and a depth of 125 ft. to an alley. No building shall be placed nearer than 20 ft. to the front lot line or 3 ft. elsewhere. The building is to have such rooms as living room, dining room, kitchen, solarium, study, bedrooms with bath. In addition to the foregoing requirements, a basement which need not be under the entire house, a covered porch, and the necessary closets should be provided. A one- or two-car garage, either attached or detached, is required, the floor of which shall not be lower than the basement of the house. No clear story height shall be less than 8 ft. 6 in. in a living portion. The so-called "shirt-front" type of exterior, in which the treatment of the rear is slighted, must be avoided.

The treatment of the unoccupied portions of the lot adds to the completeness and attractiveness of the home, therefore, careful consideration of such exterior factors as locations of buildings, approaches, room exposures, or recreation and service areas, is necessary. The character of any exterior development should be such as to accord with the requirements of the small home owner.

Recent surveys disclose that the majority of homes existing, reflect bygone standards of American life. The present approach to the designing of a home should not be merely on the basis of precedent in plan and design. It implies a careful analysis of the activities of those who are to live in the home in order to provide facilities and environment best suited to these activities. These facilities must be so balanced and adjusted as to prevent one from interfering with another. It involves planning for the multiuse of space, as well as specific spaces for each activity, with the necessary furniture and equipment.

The problem is that of a design which will develop the utmost efficiency in space utilization, in the arrangement of furniture, and equipment, and in the disposition of the mechanical and electrical plant, within the size limitations necessarily imposed by economy. Provision for health, comfort, and convenience will include the latest developments in step-saving, laborsaving, and timesaving equipment.

For purposes of supplying more specific information regarding the problem, assume that the five- or six-room house will be designed for a family of three consisting of Mr. and Mrs. Holmes and their small son, Junior, age six. This family is in moderate circumstances.

Mr. Holmes is a young businessman of thirty-three years of age. His interests are broad and his activities many. He plays golf and tennis, and likes to hunt and fish occasionally. On evenings not spent in working out sketches of new displays or on problems of his business, he may be found enjoying a book or a game of bridge with his neighbors. Occasionally there are parties or celebrations which tax the facilities of the house to the utmost.

Mr. Holmes is one of those who likes to have a place for everything and everything in its place. Even the card table and Junior's galoshes must have a handy and definite place. He believes that the equipment, furniture, closets, and even the rooms themselves have a specific use sequence. His hobby is the home workshop where he makes things for use in his home. The whole family enjoy outdoor activities.

Mrs. Holmes is a college graduate of the home-economics course. She does her own housework because she enjoys it as well as because of moderate circumstances. She insists on the best labor and timesaving devices to assist in her housework. She is a woman of good taste with no style prejudices.

Junior Holmes is a typical boy of six years. It is mainly on his account that this home is to be built to provide advantages of air, sunshine, play space, and every possible adjunct to health and development that can be provided in the small economical home. The boy's room is to be such as can be adjusted to accommodate growing interests and increasing paraphernalia of a boy who will soon be in school.

The house is to be built in a city suburb having a climate as indicated by: Mean temperature, January, 25 deg.; July, 85 deg.; highest temperature, 105 deg.; lowest, 20 deg.; mean annual precipitation, 40 in.

A seven- or eight-room house is to be built for the same family now grown to four. Junior is now a boy of 15, in high school and the new member of the family is Jane, age eight.

Mr. Holmes has advanced in the business world and wishes to build a permanent home, while Mrs. Holmes is devoting more time to various social and club activities. There is a maid who will live in the new house. The Holmes now have two cars. Other considerations remain the same.

The following drawings are to be submitted in each case, drawn on a sheet 30 by 40 in.

Plans at a scale of ⅛ in. equals 1 ft. must be drawn of the basement, first floor, plot plan, and the second floor if utilized for any requirements. Walls and partitions to be inked in solid black, and the name and dimensions of each room lettered plainly. Ranges, sinks, cupboards, and beds are to be shown.

One side and rear elevation at scale of ⅛ in. equals 1 ft., and a section at the same scale showing all walls, ceilings, and roof heights, are also to be prepared.

Graphic scales to be shown.

Perspective sketches are to be made of such interesting features as the main entrance, fireplace end or side of the living room, oriel window, and other attractive features.

A perspective of the house viewed from the street, projected from a ¼-in. scale plan and rendered in pen and ink or water color, is also to be drawn.

The sheet shall bear the title *Design for a Five- (Six-, Seven-, or Eight-) Room House,* within a border located ¾ in. from the outside of sheet. At the left of the title, there shall appear three lines of lettering within the height of the title with these words: *Architectural Drafting Department, Abraham Lincoln High School, Council Bluffs, Iowa.* At the right three lines with these words: (Your name), *Student of Architecture, R. M. Hammes, Instructor.*

The Annual Trojan Derby

Francis J. Coyte and John Emmel

C. B. Connelley Vocational High School, Pittsburgh, Pennsylvania

Combining mechanical skill and athletics in a novel activities program.

The students of Connelley Vocational High School celebrate the completion of their extracurricular activities program each year with a "Trojan Derby." Contrary to the general policy of tapering off the activities program toward the end of the school year, we at Connelley revive student interest and improve school attendance by promoting desirable mechanical interests in a competitive intramural outdoor sport that has become a permanent feature of our school sports program.

During the school year, intramural competition between shop groups is usually confined to athletic prowess, and with the recent introduction of mechanical competition in the construction of chariots and pushmobiles, a new type of sports interest has been established.

The style of vehicle is alternated each year — two-wheel chariots are featured during even years, and four-wheel pushmobiles in odd years, and by rotating the general design, the monotony of seeing the same event repeated each year, is relieved. Motion pictures are made of the derby by faculty members and exhibited several times during the year to perpetuate interest in the contest.

All ready for the derby

Early in May, the derby construction program is introduced with specific instructions as to specifications — length, width, wheel diameters, and weight. All construction details and rules governing the building, inspection, and staging of the contest are drawn up by a committee consisting of students, shop instructors, and athletic coaches, thereby bringing together all interested parties. Dr. Loron H. Turner, principal, officially inspects each entry several days before the contest, and personally signs the permit cards to participate in the derby. The reason for the approval tag on each machine is that that is the safety precaution. If a machine is so obviously flimsy and poorly constructed that it won't last, that machine is eliminated before someone gets hurt.

Cash prizes are offered for speed, mechanical construction, best-looking and most original design. All competitive teams composed of drivers, pushers or pullers, receive pie ala mode as an honorarium (win or lose) for their efforts. The budget allotment set up for this event is limited to a maximum of $20 to cover all prizes, food, and motion pictures, and is paid out of school-activities funds.

All parts and necessary materials must be furnished by the students, as school funds are not available for materials. From past records, more two-wheeled chariots have been built than four-wheeled pushmobiles, because the simplicity of chariot construction eliminates front wheels and steering equipment. However, mechanical ingenuity in the construction of the steering assembly should not be a handicap or drawback to vocational students.

Considerable intershop exchange of materials and services, and trading of surplus parts has been experienced in the past, all of which increases the number of participating departments, and has developed a genuine intershop co-operation that is desirable in any school. In this event, splendid opportunities exist for intershop co-operation. There are jobs on the chariots that belong to certain shops, and they can exchange their work for work of another shop on the first shop's chariot. For example, turning axles is a machine-shop job, while painting a car is a finishing-shop job. So, it is a case of if you turn my axles, I'll paint your cab. Before a derby is finished, every shop in a school can have had some contribution to each machine.

The derby is staged at the school athletic field, on an oval, four-lane staggered track, marked off with white lines. Three or four elimination heats are run off first, to reduce the number of entries to four final contestants, thereby eliminating the slower teams. The final event is then staged to determine the first- and second-prize winners. The number of laps around the track and the size of the track should be taken into consideration so that unnecessary physical exertion can be avoided. If plenty of student power is available, arrange for relay (spell-off positions) at the quarter or halfway mark, and increase the number of laps around the track. The rules are adopted to suit local conditions and approximate a fair chance to all contestants. The safety of the riders and drivers is also taken care of in the rules, which for Connelley Vocational High School are part of this article. With broad rules, covering only general outlines, student ingenuity is encouraged. What can be done within the rule limitations is shown by some of the accompanying pictures. The resulting machines are fast, light, strong, and safe. If a machine lacks one or more of these factors, it just doesn't win. Several derbies were decided by durability. The fastest machines — while ahead for a while — could not last. The science department gets lots of very practical, and sometimes comical examples of what happens when centrifugal force, bending moments, inadequate sections, and improper balance are not properly calculated. Wheels and axles are the base on which a shop works. After procuring wheels, the rest of the job is to design and build a machine around these wheels. Bicycle wheels, while easiest to get, don't always work out well. The axle is only ¼ in. in diameter — and the axle must be supported on each side of the wheel. When this is not done, odd things happen at the first sharp curve. When the center of gravity is too high, more things happen at the curves. All these factors are educational in a way that cannot be approximated in a classroom or laboratory.

Naming of the chariots and pushmobiles is one of the most difficult matters for the shop students to settle. Apparently there are no fixed rules governing selection of names, and from this list of past entries, the reader can determine what is usually appropriate:

Saur Kraut and Wieners	Lizzie Ford
Pie ala Mode	Spirit of Foundry
Printers Devil	Hope ? ?
Short Circuit	Spark Plug Special
High Voltage	Sweepstakes
City of Troy	Halitosis
Roman Scandal	Lightning
Trojan	Scraps and Shavings
Little Caesar	The Bat
Comet	Filer's Paradise
	Service Shadow

The entire student body of 1,700 boys and faculty assemble around the field to witness the event, assisted by the school patrol. Music is furnished by the school portable trailer sound amplifier, and announcements are made by regular student sports broadcasters. Such an event, properly sponsored, properly administered, and properly supervised, can be a source of much fun, and much learning.

Rules for the Derby

1. Each shop or shop group may enter a chariot. This is strictly voluntary.
2. As Trojans, a Trojan chariot is to be the pattern this year.
3. Each chariot shall have only two wheels. No trailer or auxiliary wheels permitted.
4. No wheel diameter shall exceed 30 in. Wheels may be made of any material.
5. The greatest width of the chariot shall not exceed 40 in. This dimension shall apply to the greatest over-all width.
6. The greatest over-all length of the chariot shall not exceed 90 in.
7. The weight of the chariot shall not exceed 100 lb.
8. To be eligible for prizes, each chariot must have tacked or nailed on, in a conspicuous place, a permit of approval.
9. Each chariot must contain a driver or rider costumed as a Trojan, who shall remain standing in or on the chariot during the entire race.
10. All chariots must finish complete and intact, including the driver or rider. Loss of wheels or parts of personnel automatically disqualifies that shop.

There will be suitable prizes for the best-looking chariot, for the winner of the final, and for the most unique chariot. The prizes will be awarded at assembly.

Lessons for Young Workers—XI

Thomas Diamond

Vocational Education Department,
University of Michigan,
Ann Arbor, Michigan

The eleventh of a series of lessons for students of industrials arts and vocational education.

What Is a Baseball Worth?

Have you ever noticed that people differ in their ideas of what is valuable? It is almost certain that you value some things more than you do others. For example, you may place greater value on a fishing rod than you do on a 22-caliber rifle, because you are interested in fishing. Another boy might prefer the rifle because of his lack of interest in fishing, while still another boy would have neither of them because he would place more value on some parts for a new radio which he is building. Because of this difference in opinion, it may be of interest to inquire into what it is that makes an article valuable.

If you examined a college textbook on economics, you would be surprised at the number of ideas regarding value you would find discussed. For our purpose, we will say that an article is valuable if anyone desires it so much that he is willing to trade something for it.

It should be remembered that one person may be more anxious to obtain some article than another and may be willing to give more in trade for it. If this is true, then the article is more valuable to the first person than to the second. For example, two boys may have 25 cents each to spend. One would be perfectly willing to pay out his whole quarter in order to obtain a rare stamp which he needs to complete a set he has in his collection. The other boy has a copy of the stamp but he would be willing to spend a dime to secure a second copy. However, he does not want it so badly that he is willing to spend all his money on it. In the first case, the demand is greater than it is in the second case; consequently, the first boy values the specimen more highly.

Again, if the stamp is a common one and easily obtainable it is probable that the first boy would not pay more than 5 cents and the second one would not give anything for it. In other words, if there are more stamps than there are boys who want them, the stamp decreases in value.

As another illustration of this difference in value, we might consider a pair of ice skates. A boy who is interested in skating might place great value on a pair of skates if he lived in northern Michigan during the winter. On the other hand, the skates would be useless to him and he would value them accordingly if it was summertime and his home was in New Orleans. In this case, we find that the place where the article is, and the time that it happens to be there, help determine its value.

Again, water is an absolute necessity if people are to live. Because of this it is extremely valuable. However, a person can only use a limited amount. If the person lives beside Lake Michigan, he can still use only this limited amount. The huge amount at his command over and above what he uses is valueless to him because no one will buy it from him. Other people have the same chance to draw from the lake that he has.

On the other hand, if an individual were in the middle of the Sahara Desert and had just enough water to keep his engine cool until he reached the next waterhole, would he not place greater value on the quantity he had than he would on a similar quantity if he were traveling a road by the side of a river?

Furthermore, if the tourist in the desert had five gallons more than he needed, and met some other tourists whose radiator had been leaking, would the second tourist not be willing to give all the money he had to obtain some of what the first man did not actually need?

Thus we see that:

1. Some things are valuable because they are necessities.
2. The value of an article changes as the supply and the demand change.
3. The value of an article changes according to the place in which it happens to be.
4. The value of an article is changed by the time it happens to be in any place.

Questions for Discussion

1. Is air valuable? Why?
2. Would air be more valuable to a group of entombed miners than to a person who lived in the open?
3. Would a person who lived at the equator put great value on a pair of ice skates?
4. What would you think of a merchant who tried to sell you some Christmas cards in the month of July? Why?
5. Where is the Sahara Desert?

Testing and Tests

Card-File Test Building

Homer C. Rose and Roy R. Van Duzee

Public Schools,
West Allis, Wisconsin

A method which will be helpful to the teacher of any shop subject.

Good teaching calls for a frequent objective inventory of pupil achievement. The scientific tools for this are good tests. Industrial-arts teachers as a rule agree that a comprehensive program of testing should be carried on in every subject, yet one is apt to speculate on the question, "How much use is being made of the good test material that is frequently published and how many teachers find time to conscientiously carry on a good testing and test-building program?" Perhaps too frequently no test is available that just meets the need and a poor test is used, or the testing is put off for another semester.

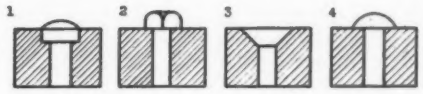
There is a plan, however, which makes it possible for the busy teacher to construct a good test whenever he needs one, and with a minimum of time and effort. Such a plan we call the *card-file test-building technique*. Briefly, this plan consists of having typed all available uncopyrighted questions on cards — one question on a card — so that when a test is needed on a specific unit of work, those test cards are selected which cover the subject. These cards are then arranged with cards covering the heading, instructions, etc., and turned over to a typist who copies them in order and the test is ready. Good 100-question tests can thus be organized in less than half an hour.

MULTIPLE CHOICE

Directions: Below are a number of incomplete statements. After each statement there are four drawings, each preceded by a number. You are to choose the right answer and write its number in the proper blank on the answer sheet.

SAMPLE #9.

THE SECTION SHOWING A COUNTERSUNK SCREW IS



SAMPLE #10.

Drafting 10A
Ind. Arts Dept.

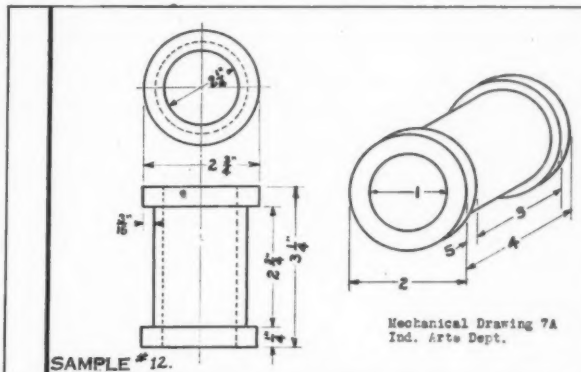
W. A. Test

5 x 8" CARDS USED FOR QUESTIONS WHICH MAKE USE OF DRAWINGS

COMPLETION QUESTION - READING A DRAWING

Directions: From the working drawing select the dimension corresponding to the number in the pictorial drawing and place the dimension opposite the number given on the answer sheet.

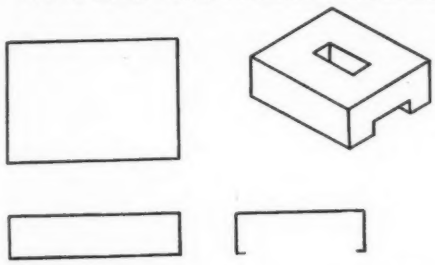
SAMPLE #11.



Mechanical Drawing 7A
Ind. Arts Dept.

SAMPLE #12.

FROM THE ISOMETRIC DRAWING COMPLETE THE WORKING DRAWING.



Mechanical Drawing 7A
Ind. Arts Department

W. A. Test

SAMPLE #13.

REARRANGEMENT

Directions: Below is a list of operations. Select the operations used in squaring up a board to dimensions and number these operations in the proper order. Place the proper number in the blank space before each operation.

1...Select a face side
.....Place a face mark on face side
.....Place a face mark on face edge
.....Place a face mark on face end
.....Plane to the line and square with face side
4...Plane to the lines for thickness
.....Select a face end
.....Plane face side smooth and flat
.....Plane face end square with face side and face edge
.....Saw and plane second end square with face side and face edge and down to the line
.....Plane face edge square with face side
.....Plane a chamfer on face end and waste edge
.....Measure for length from face end
.....Mark width from face edge
.....Mark for thickness from face side
.....Plane a chamfer on second end and waste edge

SAMPLE #14.

Fig. 2. No. 10, blue card; Nos. 12, 13, 14, yellow cards

The method is usable, flexible, easy to keep up to date, and meets the requirements for a testing program in our rapidly changing courses.

The following paragraphs describe, in detail, a method of building and using such a test card file. It is assumed that those using the file will have a knowledge of educational measurements and no attempt will be made to cover the theory of testing.

Selecting the Questions

To start a file of test questions for a course, select from all available sources uncopyrighted questions and copyrighted questions which have been published with the understanding that they may be reproduced for testing purposes. Go through the tests and delete unnecessary, and undesirable questions, and also those which involve repetition within a given type of question.

Choose cards of different colors for the various types of question, i.e., salmon for true-false questions, yellow for completion questions, blue for multiple-choice questions, and so on. Have 3 by 5-in. cards cut for those questions which do not require large drawings (Fig. 1) and 5 by 8-in. for those questions which make use of large drawings (Fig. 2).

Lay Out Standard Heading for Cards

Determine upon a standard heading for each card so that the card may be properly replaced when removed from the file. Such a heading as shown on the sample cards (samples 4, 6, 8, Fig. 1) will be found valuable as it makes it possible for others to intelligently use the file and keep it in order. Where clerical help is available, much of the routine work, such as the writing of answer sheets, can be done from the cards. The source and page number make a record of written instruction being covered and are valuable as a reference when the question is being discussed by students.

Copy Test Questions

Copy questions of each type on cards of color selected for that type of question. For questions which make use of drawings, use the 5 by 8-in. cards allowing a margin of ½ in. on each side of drawing.

(The 7-in. space is the effective width of a stencil.) See samples 10, 12, 13, Figure 2. The quality of typing required for the file and the bookwork necessary to fill in the blanks in the heading can be done by the average NYA worker. As new test questions become available or are written for a course add them to the file.

File the Test Cards

Two methods of filing the cards have been found practical. The first one as illustrated in Sample A, Figure 3, is perhaps the one that individual teachers will prefer for their own use as all of the types of questions for one subject are located in one box drawer. The second method as shown in Sample B, Figure 3, is the best when the department is building a test file for all courses taught. The 5 by 8-in. cards will be fewer in number and can best be filed in one section as shown at C, Figure 3.

Standard sets of general directions for writing the test, etc., should be typed on white cards to distinguish them from all others. A directions card should be worked out for each type of question, and cards carrying other standard information such as the test heading may also be prepared. See samples 1, 2, 3, 5, 7, Fig. 1, and 9 and 11, Figure 2.

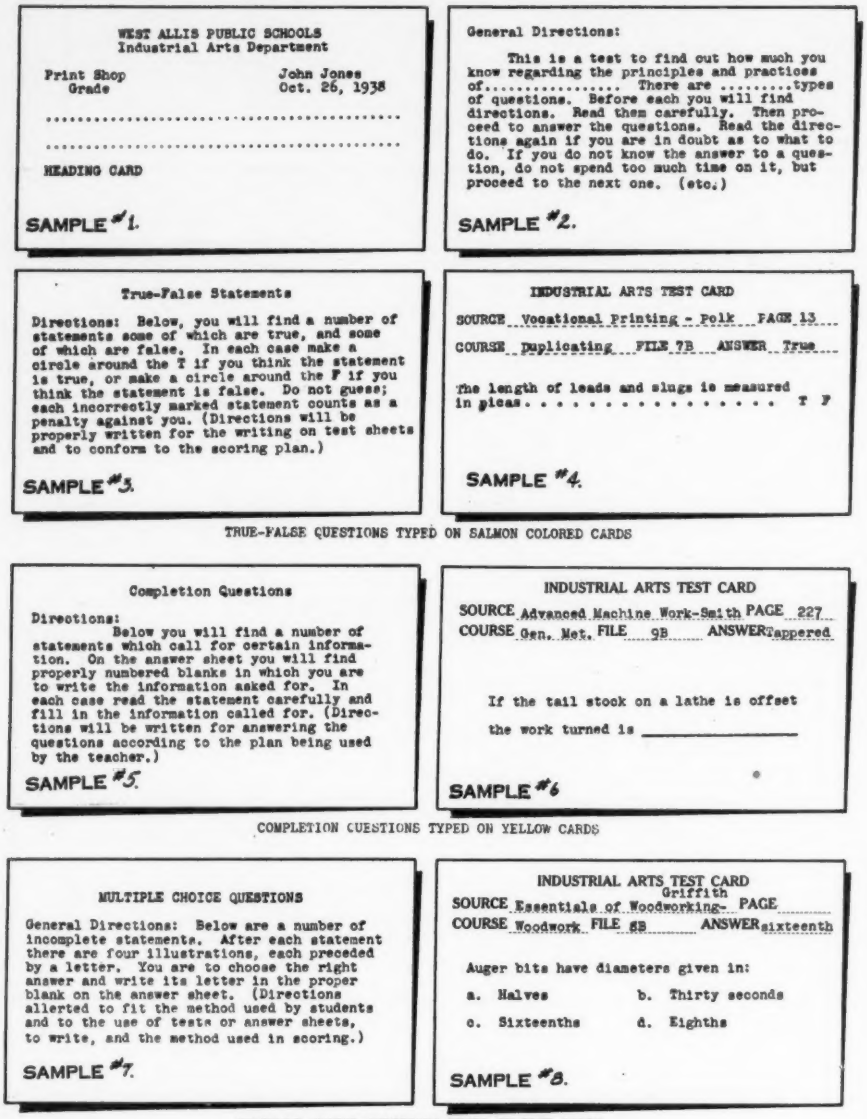

WEST ALLIS PUBLIC SCHOOLS
Industrial Arts Department
Print Shop
Grade
John Jones
Oct. 26, 1938
HEADING CARD
SAMPLE #1.
General Directions:
This is a test to find out how much you know regarding the principles and practices of..... There are .....types of questions. Before each you will find directions. Read them carefully. Then proceed to answer the questions. Read the directions again if you are in doubt as to what to do. If you do not know the answer to a question, do not spend too much time on it, but proceed to the next one. (etc.)
SAMPLE #2.
True-False Statements
Directions: Below, you will find a number of statements some of which are true, and some of which are false. In each case make a circle around the T if you think the statement is true, or make a circle around the F if you think the statement is false. Do not guess; each incorrectly marked statement counts as a penalty against you. (Directions will be properly written for the writing on test sheets and to conform to the scoring plan.)
SAMPLE #3.
INDUSTRIAL ARTS TEST CARD
SOURCE Vocational Printing - Polk PAGE 13
COURSE Duplicating FILE 7B ANSWER True
The length of leads and slugs is measured in picas. . . . . T F
SAMPLE #4.
TRUE-FALSE QUESTIONS TYPED ON SALMON COLORED CARDS
Completion Questions
Directions:
Below you will find a number of statements which call for certain information. On the answer sheet you will find properly numbered blanks in which you are to write the information asked for. In each case read the statement carefully and fill in the information called for. (Directions will be written for answering the questions according to the plan being used by the teacher.)
SAMPLE #5.
INDUSTRIAL ARTS TEST CARD
SOURCE Advanced Machine Work-Smith PAGE 227
COURSE Gen. Met. FILE 9B ANSWER Tappered
If the tail stock on a lathe is offset the work turned is _____
SAMPLE #6
COMPLETION QUESTIONS TYPED ON YELLOW CARDS
MULTIPLE CHOICE QUESTIONS
General Directions: Below are a number of incomplete statements. After each statement there are four illustrations, each preceded by a letter. You are to choose the right answer and write its letter in the proper blank on the answer sheet. (Directions allerted to fit the method used by students and to the use of tests or answer sheets, to write, and the method used in scoring.)
SAMPLE #7.
INDUSTRIAL ARTS TEST CARD
SOURCE Essentials of Woodworking- Griffith PAGE
COURSE Woodwork FILE 8B ANSWER sixteenth
Auger bits have diameters given in:
a. Halves b. Thirty seconds
c. Sixteenths d. Eighths
SAMPLE #8.
MULTIPLE-CHOICE QUESTIONS TYPED ON BLUE CARDS

Fig. 1. Samples of test cards

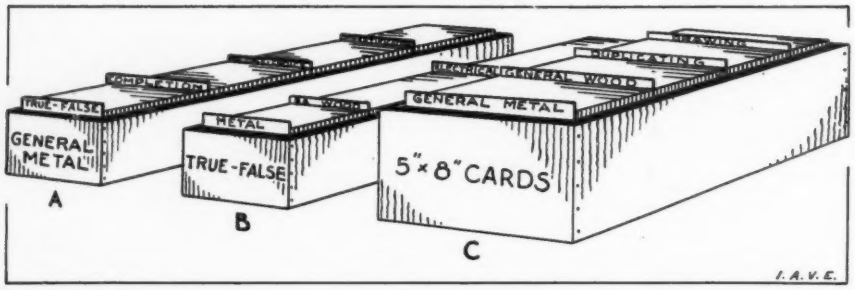


Fig. 3

To Construct a Test

1. Take all true-false cards for the course from the file and select by sorting into two piles those questions that cover a point in the unit being tested, and those that cannot be used.

2. Run through the selected stack of cards and eliminate the least desirable questions in order to get the proper or desired number of questions.

3. Repeat this process for the other types of questions on the subject.

4. Arrange the cards in the order of difficulty or in any way desired.

5. Add a *heading* card for the test and a *directions* card for each type of question. Stack the cards and the test is ready to be turned over to the typist who will not only type the test, but make out the answer sheet, and refile the cards, as well. The fact that the questions are already typed and in good order will materially help the typist to do accurate work.

The method of selecting and filing questions makes it possible to easily keep tests up to date. Since they can so easily be changed, there is less tendency to use tests which do not exactly fit the ever-changing course of the progressive teacher. Due to the very large number of questions on file, the cards may be used for review purposes, spell-down, and special examinations without repeating the use of a question. As new test material becomes available, the file can easily be improved by the addition of such material.

Almost all of the work of making this collection of questions can be done by available office employees and the teacher can have all the list material he can use with a minimum of time spent, thus giving him time to do those things in the school which only he can do well.

The right use of leisure is no doubt a harder problem than the right use of our working hours. The soul is dyed the color of its leisure thoughts. As a man thinketh in his heart so is he. — *Dean Inge.*

What we do upon some great occasion will probably depend on what we already are; and what we are will be the result of previous years of self-discipline. — *H. P. Liddon.*

Industrial-Arts Testing and Project Grading

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Seattle, Washington

Controversy exists in the special field of industrial arts concerning the testing of the content and the grading of projects to award marks.

In this field, there are aspects to be tested that are unique and therefore require special treatment. These are the informational and technical, and the manipulative aspects. This means that in order to reliably measure the work of the shop student for the purpose of awarding marks, two kinds of tests are required. Generally, these are called performance tests for measuring manipulative techniques and the ordinary pencil-and-paper type for the measuring of information.

A test for measuring nonmanipulative aspects is a type of test designed for the measurement of knowledge of facts underlying the student's actual manipulative dexterity. It is a paper-and-pencil test and is used only for measuring those outcomes that lend themselves to such treatment. This type of test is divided into the essay and objective types of exercise which are either standardized or teacher-made. Teacher-made tests, while probably not as well constructed as standardized tests, will in all probability be more valid. They are extremely useful in diagnosing pupil difficulty and for measuring class achievement. The value of this type of test in shopwork, whether in the junior high school or senior high school, is granted, and no program is worthy unless an adequate testing program is provided.

The testing of performance in industrial arts is not new, but because the reliability has generally been low, the tendency has been to underestimate its value. All the difficulties, however, have not been removed, as the scoring, while not so objective as that possible with the pencil-and-paper type of test, is better than teacher judgment. Another difficulty has been caused by the attempt to measure manipulation by pencil-and-paper techniques. Obviously the methods are neither valid nor reliable. It should be kept clearly in mind that a performance test is not a speed test, but rather one that will measure quality or accuracy. The purpose is to determine the achievement of the pupil in terms of manipulative dexterity, regardless of the time spent.

Objectives of testing, as in other phases of education, are apparent in the special field. Teachers need to know why testing is necessary, not only for the information it gives about the pupil but also for the information it reveals about the teacher. However, doubt exists as to the need for grading projects to award marks by a study of the operations incorporated in them, especially in view of the large classes now being taught.

Emphasis on manipulative skill connotes vocational preparation which is in direct contradiction to the aims and objectives so far advanced by leaders in the field of industrial arts, the implication being, that actual vocational training in an industrial-arts program is untenable. In the first place, other agencies better suited to this undertaking are provided. Secondly, such a program is not in keeping with the aims of general education, of which we are a part. And finally, most schools are not adequately equipped to carry on such a program. The question arises then as to the necessity for the grading and subsequent marking of projects by a detailed analysis of operations incorporated in them. In the junior high school, the program's basic purpose is to acquaint the individual with the industrial activities of the nation for the guidance values inherently contained in them. In some quarters, then, the assumption will be that shop, as such, is superfluous. Such arguments are immediately answered by the ideals of progressive education which insist that education be in terms of the individual rather than in terms of content. In order to be in keeping with this doctrine, shop must be included in our educational system if such remarks as "I wish we had shop all day," "Oh, do we have to quit now?," and other similar remarks attesting to the desire on the part of the pupils to partake in shopwork are any criteria. These and other similar remarks have been heard again and again in the shop.

Getting back to the assumption stated earlier that detailed project grading is questionable in the junior high school, it can be said that too much emphasis on this activity might lead the teacher to stress the doing in preference to the knowing units. While it is recognized that the ultimate product of the shop is the project, this in no sense means that the prime objective is manipulation. Rather, it is the means to the end; namely, the acquiring of industrial knowledge and methods, and the satisfaction accorded the pupil through his having had manipulative exercises. Of not such great value, but of importance, is the training accorded the individual that will better fit him for the job of keeping his home in perfect running order. However, in any case, the awarding of marks based on the operations in a project will not affect the way the job is done at home. Rather it would seem of greater import were the pupil to see a job expertly done. In this manner he may compare his own efforts and endeavor to attain the perfection of workmanship displayed in the example. In the senior high school there probably is more need for the grading of projects in detail. In keeping with the aims, the industrial-arts program in this school becomes more vocational in nature. It is assumed that the majority of those electing this subject, do so with the idea in mind of following, as a lifework, the course they are selecting or one closely allied to it. If this is so, then greater importance must be attached to manipulation and less to information. This may be justified in view of the increasing evidence that marks secured in a lower institution are the best criteria of the possibilities of that individual in the next higher level. Therefore, if an individual is to choose some manipulative vocation, be it surgery or drawing, it is necessary that some criteria be set up, and, as marks are the best, then his work must be graded more carefully. In the senior high school, this is more easily accomplished because of the smaller classes. However, vocational training is not the supreme objective, and the informational units must be accorded ample emphasis.

Industrial-arts work requires that the emphasis be not placed on skill, hence the value of grading student work by means of a rating scale.

Less emphasis on the manipulative aspects in the junior high school, with slightly more in the senior high school, is a step in the direction of integrating the industrial-arts program with the general educational setup. However, unless marks of some kind are awarded on projects, there may be a tendency toward slipshod work on the part of some pupil that subsequently may lead to undesirable character traits. This will, however, apply with greatest force to only a few of the pupils, as in most cases their natural competitive nature precludes poor work on the part of all. We are aware that marks are a spur to greater activity and for those who lack personal initiative they probably are necessary. Regardless of these and other facts, it still remains that the awarding of marks based on detailed examination of projects need not be emphasized except in special cases.

Since marks are mandatory in most schools, and since the more variable the testing devices, the better the chance of awarding valid marks, the more it becomes apparent that some value should be accorded manipulative skill. The answer is the performance test. While the operation units are basic and are included in the jobs, their uses are not similar. For instance, one pupil may build a table including a mortise-and-tenon joint. However, some other pupil may build a cabinet incorporating a similar joint but modified to make a place for the panel groove. Here are two joints, similar but not equal in difficulty.

The awarding of marks then becomes more difficult and the marking increasingly less valid and reliable. It seems, then, that in order to get a cross section of the pupil's accomplishment all should be required to do the same operation. Here is where the performance test proves its worth, as all pupils are given equal opportunity to show their manipulative dexterity under identical conditions. Appreciations, ideals, and attitudes on the part of the pupil may be ascertained by the care and thoroughness he exhibits in the performance of the activities contained in the test. These traits, however, should not influence the mark awarded for manipulation, but the experienced teacher may recognize the undesirable attitudes and take steps to correct the difficulty.

As previously mentioned, large classes preclude meticulous attention to the details attending the grading of projects, as too

much time spent at this activity takes away from the attention that should be directed to the other numerous duties of the teacher. The process must be simplified and a partial solution is given. Every shop teacher should have a list of the things he desires to teach that will incorporate the problems he wishes the pupil to solve. This is best accomplished through the use of an analysis supplemented by a progress chart. This is desirable particularly in the junior high school, where the items should be further segregated according to difficulty to fit the grade in which the material is to be covered. Further, a list of jobs incorporating the units to be taught should be posted. The pupil may make or modify these to suit his personal ideals. Then it becomes the duty of the teacher to construct a project that is representative of those jobs he has posted. Especially is it important that his job incorporates the operations he wishes the pupil to learn. That will mean a separate job for each class he teaches, which normally means three. These jobs will display the best work that it is possible for the teacher to do, and will be complete, including a bill of material, a plan of procedure, drawings, and the like. These jobs then serve as the criteria to which the pupils' jobs will be compared. Strict examination of joinery, gluing, screwing, and measurements, will not be attempted, but rather a comparison of the whole job done by the pupil will be made with that of the teacher's. Such items as finish, design, smooth operation of doors or drawers if they are a part of the job, hammer or screw marks, dirt, and other readily discernible factors will be noted. The projects may then be ranged on this basis, from poor to excellent, and marked accordingly.

This process simplifies the tedious and often cursory examination accorded the finished projects, which far from assures valid or reliable marks. Doubt may arise as to the objectivity of the method and well it may. However, objectivity may be more closely approached if the teacher constructs a rating scale of projects similar to the rating scale of operations advocated by Newkirk and Greene,[1] but not so extensive. This rating scale might consist of not more than three jobs in each grade, which all together would mean nine for the average junior high school. These might well be constructed and permanently placed in the shop, where they could provide constant competition for the pupil, urging him to attain the perfection as exhibited in the finest article in the scale for his particular grade.

The conclusion is that less emphasis be placed on marking projects in terms of operations, while more stress should be given to rating in terms of general appearance, as determined by comparison with the projects built by the teacher. To objectify this scale, rating by experts may be utilized. On the other hand, too much emphasis cannot be placed on the necessity of tests whose major function is the measurement of outcomes not readily determined by manipulative techniques.

[1]Newkirk and Greene, *Tests and Measurements in Industrial Education* (New York: John Wiley and Sons, 1935), Chap. XII.

Methods of Testing in Mechanical Drawing

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Frequently the statement is heard that drafting instructors spend too much time teaching students to develop drafting techniques at the expense of the knowledge involved, or in other words, the students know how to draw but do not know how to express their knowledge of mechanical drawing, or are sadly lacking in general and specific knowledge of the subject. Along with these statements, one often hears the idea expressed that the majority of students taking mechanical drawing in the secondary schools or even in college, will not become draftsmen. Therefore, it is more important to teach a knowledge of the subject of drawing, which is basic and needed in many jobs, or positions in industry other than drafting, than to stress development of drafting techniques.

While there is much truth in the foregoing statements, it is not wise to go to the other extreme and slight drawing technique. The student who is allowed to turn in an inaccurate, dirty, or otherwise poorly executed drawing fails to develop pride and interest in his work and is quite apt to lose interest in the subject or become a careless workman. Knowledge of drawing will not help such a student to make good in any position in industry which requires individual accuracy and thoroughness. The striving of the student to develop drafting technique helps to develop qualities of character or workmanlike habits which are needed in modern industry regardless of the type of job or work the apprentice worker is employed to do.

It is the belief of the writer also that any method of teaching or testing that tends to increase or arouse student thought and effort, to stimulate interest and impart knowledge of the subject is a worthy objective; that students who absorb a knowledge of drawing through individual effort or from group discussions will, with proper supervision and guidance from the instructor, develop a good drafting technique because they will know what they are doing or *know how* before they attempt to execute or make the drawing. When students are taught how to think and how to work, drafting technique improves as a by-product due to constant practice and effort on the part of the students themselves.

While much knowledge both of a general and specific nature can be given the student with the aid of job sheets, information sheets, or a well-organized drafting text, instructors should not rely purely on these methods as many students do not read carefully or accurately, or lack the ability of persistent effort or concentration of thought in study. For such students the value of short lectures by the instructor, group discussions at opportune or convenient points in the course of study, and of short quizzes or tests given at intervals during the course, and a final examination as a method of determining student grasp of knowledge and progress during the term, should not be overlooked.

Quizzes or final examinations should not be given with the idea of exposing the student's lack of knowledge, but rather to determine individual weakness relative to fundamental knowledge presented during the course, and then opportunity should always be provided for questions or group discussion relative to points or questions missed in quiz or final examination. The final examination should be given the week before the end of a course or the close of a term or semester to allow plenty of time for correction, return, and discussion of the questions involved with the students in the various classes. This procedure would result in clearing up many wrong conceptions and difficulties encountered by students taking a technical drawing course. The written quiz or examination, when used in this manner, becomes an effective tool or method of imparting knowledge of the subject. Care should be taken in using any test to be sure that the questions involved have been presented in class previously by the instructor in lecture or in group discussions.

The foregoing statement applies to the *true-and-false test* submitted herewith. This test consists of 43 false and 57 true statements, designed to test or bring out fundamental knowledge of drafting as taught in senior high schools, trade

Drawing techniques should not be neglected in the teaching of mechanical drawing even with industrial-arts students. Tests should be used frequently to find out just what the student has learned.

schools, and beginning courses of study in colleges. This test is designed as a final examination after a student has had considerable practice in detail and assembly drawing, and should be given upon completion of advanced courses taken in senior high or trade school, or at the end of a college course of study wherein there has been an adequate treatment of the subject matter involved.

The value of the true-and-false test is well established in the educational world as an effective type of testing. Much more subject matter can be covered by its use than with any other type of test in a relatively short time. It is advisable to use a large number of questions with this type of test, to eliminate the element of guessing. It is also well to vary the arrangement of true and false statements throughout the test, as shown in test submitted herewith, so that there is no chance to mark questions alternately true or false by guess and make a high score with any degree of success. With a large number of questions the percentage marked correct as a result of guessing on the part of the student would constitute a small or negligible percentage of the final score made. The student to be successful in writing a test of this type must know the answers and possess the ability to read carefully and accurately. If for no other reason, the True-and-False type of test is valuable in that it does put students on the alert to read more carefully and accurately, and at the same time, its use will result in students being more apt to study their textbook or the assignments given during the course of study. Another desirable feature of this type of test is that it can be graded quickly and accurately on an objective basis by the instructor, or by a student assigned to that task. Relative to the amount of time allowed for the test submitted, one hour will be sufficient with students who are familiar with writing such tests. Some students will finish it in much less time, however, it is advisable to encourage their taking the full amount of time rather than doing the test hurriedly. If the majority of any class fail to complete the test by the end of the hour, the instructor giving the test would be wise in extending the time allowed, if possible, as insufficient time allotted tends to encourage guessing on the part of the students. In giving the test, students should be instructed to read each statement carefully and then answer *true* or *false*, going through the entire examination answering only those questions they are sure of, and then go back and read more carefully those questions they had difficulty with upon first reading. Statements not answered will be marked wrong.

A careful study by the instructor desiring to make use of the true-and-false test which follows, should make it adaptable for use in any given teaching situation. While some instructors may wish to alter or change some of the statements to fit their situation, the writer hopes that the test will prove helpful and beneficial in its use.

True and False Examination

NOTE: *Read carefully*, then mark a *T* or *F* in front of each statement according to whether it is *True* or *False*.

.... 1. All four edges of a drawing board are parallel and at 90 deg. to each other.

.... 2. The angle between the head and the blade of a T square is 90 deg.

.... 3. By combining the 30–60 deg. triangle with the 45-deg. triangle, it is possible to obtain a 15-deg. angle.

.... 4. A draftsman often draws along the edge of the triangular scale in making horizontal, vertical, and slanting lines on a drawing.

.... 5. To obtain an angle of 90 deg. between two lines, it is always necessary to have a horizontal and a vertical line intersect or meet.

.... 6. In the case of a right-handed person, it is customary to draw horizontal lines from left toward right with the aid of the T square.

.... 7. When a person is right-handed, vertical lines should be drawn from bottom toward top along the vertical edge of the triangle, with the triangle held firmly against the T square.

.... 8. The wedge-shaped pencil point or lead is best for use in forming freehand letters as it does not wear down as rapidly as the cone point.

.... 9. Freehand Roman lettering is used in placing notes on woodworking and machine drawings.

.... 10. Freehand Gothic lettering is used for all lettering on woodworking and machine drawings.

.... 11. Slant upper-case or capital Gothic letters are used entirely on all machine drawings without exception.

.... 12. The style of lettering used on architectural drawings in practice is the same as that used on machine drawings.

.... 13. Lower-case Gothic lettering is often used on map drawings.

.... 14. A 3B drawing pencil should be used to make object lines on a view stand out in contrast to light extension and dimension lines.

.... 15. Parallel slanting lines can be drawn by the use of two triangles, holding one stationary and sliding the other against it.

.... 16. The engineer's scale is commonly used by draftsmen everywhere in making machine drawings.

.... 17. The architect's scale is used only by architectural draftsmen in making architectural plans and cannot be used in making machine drawings.

.... 18. Scales commonly used in machine drawing are ½, ¾, and full size.

.... 19. Drawings are often made to small scale to secure a more accurate layout of the object.

.... 20. Drawings of tiny objects or parts are often enlarged or drawn to a scale larger than full size in order to show the details of construction clearly.

.... 21. When a detail drawing of an object is made accurately to scale full size, it is common practice not to give dimensions on such a drawing.

.... 22. Perspective drawing is a form of pictorial drawing used mostly by architectural draftsmen.

.... 23. Isometric drawing, a form of pictorial drawing, is extensively used for illustrative purposes in drawing textbooks.

.... 24. Cabinet drawing is used to illustrate furniture designs in advertising circulars and sales catalogs.

.... 25. Orthographic or working drawings which show the various views of an object are used extensively by draftsmen and mechanics everywhere.

.... 26. Third-angle projection is used to obtain the position of views and to determine visibility of lines on views in making machine drawings in this country (U.S.A.).

.... 27. Third-angle projection is used extensively in European countries making machine drawings.

.... 28. In industrial drafting practice, it is the usual practice to draw four views of an object.

.... 29. In making a 3-view drawing, the left end or side view is usually drawn in preference to a right-end or side view of the object.

.... 30. When an object has a slanting surface in one view that does not show in true projection in either of the other two views, it is customary to make an auxiliary view, obtaining such a view by looking perpendicularly at the slanting surface.

.... 31. An auxiliary view shows clearly and accurately the shape of the slanting surface of an object and gives an accurate location of holes or grooves laid out on that surface.

.... 32. In making dotted lines to represent hidden edges, the dashes should be made ⅛ in. long with about 1/32-in. or 1/16-in. space between dashes.

.... 33. When a dotted line representing an invisible surface or edge comes out on a visible surface or edge, the last dash should touch the surface or edge.

.... 34. Two types of dimensions given on any drawing are: Size and location or position dimensions.

.... 35. In dimensioning circles or holes, it is customary to give the radii instead of the diameters.

.... 36. When a casting is to be finished on all surfaces, it is customary to place an *f* mark on every surface.

.... 37. When a casting is to be finished on several surfaces, an *f* mark is placed on the edge view of each of these surfaces in the views shown.

.... 38. In the case of a drilled or reamed hole, it is not necessary to show a finish mark, as the note *drill* or *ream* implies or means a finished surface.

.... 39. It is customary to dimension a casting from finished surfaces whenever possible or from main center lines.

.... 40. It is not a good practice to locate holes from main center lines when there are no finished surfaces available.

.... 41. It is usually customary to give over-all dimensions on a detail drawing.

.... 42. As a general rule it is well to place dimensions between views as far as possible, and to place leader lines and notes outside or above the views, rather than on or between the views.

.... 43. It is a good practice to give location and size dimensions next to or near the hole or groove on the view where it is laid out, rather than to the dotted-line view of the hole or groove.

.... 44. It is a waste of time to keep rows of dimensions a uniform distance apart or in line with each other on opposite or adjacent views.

.... 45. It is a good plan not to dimension on the views any more than is necessary and to avoid dimensioning to dotted lines if possible.

.... 46. Numerals should conform in size and character to the notes and other lettering on the drawing.

.... 47. Fraction bars in fractional dimensions should be made on a slant or inclined.

.... 48. Horizontal dimensions should be read from the bottom of the drawing.

.... 49. Vertical dimensions should be read from the right side of the drawing.

.... 50. Dimensions placed in an inclined line should be placed so that they can be read horizontally by turning the drawing through the smallest possible angle.

.... 51. A fillet is the same thing as a round on a pattern drawing.

.... 52. In a series of parallel rows of dimensions, it is not good practice to stagger dimension numerals.

.... 53. Dimensions on machine drawings up to and including 72 in., are generally expressed in inches and those greater than this in feet and inches.

.... 54. It is a good plan to repeat dimensions on different views to make it easier to read the drawing.

.... 55. In production work, *tolerance* is the amount of variation allowed in the size of a part, or the difference in thousandths of an inch between high- and low-limit dimensions.

.... 56. In the fitting of mating parts, *allowance* is the intentional difference in their dimensions given in thousandths of an inch.

.... 57. In making a full-section view, it is understood that one half of the object is cut away or removed to obtain such a view.

.... 58. In making a quarter-section view, one quarter of the object is cut away or removed, then by looking at the cut surface on the remaining portion of the object, such a view is obtained.

.... 59. In making a half-section view, one quarter of the object is cut away or removed.

.... 60. Dotted-line work usually shows up the interior edges of a complicated casting so that it is not necessary or desirable to use a sectional view for this purpose.

.... 61. Dotted lines or hidden edges behind section views are usually omitted.

.... 62. Revolved sections are used to show the shape or cross section of spokes and rims on flywheels, handwheels, and structural shapes such as I beams, angle irons, etc.

.... 63. When a cutting-place line is used to show where a section view is cut or taken, and the section view is drawn out to one side on the drawing instead of on the view, such a section is called a removed section.

.... 64. An offset section can be obtained by drawing the cutting-plane line straight across the object and parallel to the main center line, but at any desired place off the main center line.

.... 65. In making a phantom section, adjacent parts are shown with dotted outlines, while the outlines of the section view are shown solid the same as the crosshatching lines.

.... 66. The spacing between crosshatching lines varies from 1/32 in. for very small cross-sectional areas, 1/16 in. for medium areas, and ⅛ in. for large areas.

.... 67. It is often desirable to reverse the slant of crosshatching lines on a single part drawing or sectional view.

.... 68. Crosshatching or section lining is usually drawn at a 45-deg. angle and may be inclined either to the left or to the right as desired.

.... 69. The two classes of working drawings are: Detail and assembly drawings.

.... 70. A detail drawing shows every part of the machine or project in its proper relation to every other part.

.... 71. An assembly drawing shows all the parts of the machine put together, usually with one view in section to make clear the interior construction or relation of mating parts.

.... 72. When an assembly drawing is shown with a sectional view, the crosshatching lines are reversed on adjacent parts.

.... 73. It is not necessary to give notes and dimensions on a detail drawing when it is drawn accurately to scale.

.... 74. It is not important to lay out an assembly drawing accurately to scale as it is just used in the shop assembly department to show how the parts are to be assembled or put together.

.... 75. In making out a *bill of parts* on an assembly drawing, it is not necessary to list standard stockroom parts, such as screws, pins, keys, etc.

.... 76. All parts such as screws, keys, pins, used in connection with a project should be detailed or drawn, complete with all dimensions given.

.... 77. When a sectional view of an assembly drawing is made, pins, shafts, keys, bolts, and screws are usually shown in section.

.... 78. On a sectional view of an assembly drawing, it is necessary to show the proper section lining or crosshatching to indicate the materials of which the various parts are made, using the American Standard symbols.

.... 79. The *V, American Standard, Square, Acme, and Standard Worm Threads* are used more than any other thread forms in this country (U.S.A.).

.... 80. In semiconventional representation of threads, the single-cut thread is drawn with a ½-pitch space incline or slant on crest lines, double thread with a full-pitch space slant, triple with 1½-pitch spaces slant, and quadruple with 2-pitch spaces slant.

.... 81. In conventional representation of threads on fasteners or shafts or holes 1 inch or less in diameter, the V's are omitted, the crest lines are fine lines and may be drawn vertically, and the root lines are drawn heavier in contrast to the crest lines.

.... 82. The *American Standard National Coarse Thread* is used extensively on automotive and airplane parts where vibration is a factor to be reckoned with.

.... 83. The *American Standard National Fine Thread* is used for all general-purpose work or on all fasteners used in machine construction.

.... 84. The square and acme threads are larger threads but do not possess the strength of the American National Coarse Thread.

.... 85. In laying out square thread, it is necessary to multiply the number of threads per inch by 2 to determine the number of spaces to lay out per inch.

.... 86. The inside diameter of an ⅛-in. pipe is the same as the nominal size or diameter.

.... 87. A hexagon-head cap screw is practically the same size as a hexagon-head bolt and is used in the same manner as a bolt.

.... 88. Keys are used to fasten or lock machine parts together in a more permanent and positive manner than is the case when setscrews are used.

.... 89. Spur gears are used to transmit motion between parallel shafts.

.... 90. Bevel gears are used to transmit motion between shafts whose axes intersect or meet.

.... 91. Worm gears (worm and worm wheel) are used to connect shafts which are at right angles to each other but do not intersect or meet.

.... 92. The speed ratio of two spur gears depends directly or is determined by the pitch diameters selected.

.... 93. The number of teeth in a spur gear can easily be determined when the diametral pitch and the pitch diameter are given.

.... 94. Since a freehand sketch of a machine part cannot be made accurately to scale and dimensions of length, width, and thickness are only approximately in proportion, the freehand sketch is not used generally in industrial practice.

.... 95. There are only two types of modern electric blueprinting machines; namely, the vertical and the horizontal.

.... 96. A blueprint is made by placing the ink tracing with the ink lines down against the blueprint paper and exposing to light in a blueprint machine, then washing in water, then in a fixing solution, and then finally in water again.

.... 97. A blueprint positive print has a white background with blue lines, the reverse of the ordinary blueprint, and is made from a Van Dyke negative, which is made by

placing the ink tracing with the ink lines down against the Van Dyke paper and exposing to light in the blueprint machine, then washing in water, a fixing salt, then again in water. After this negative is dry, it is oiled or transparentized before using on blueprint paper to obtain the positive print.

.... 98. An Ozalid print can be made by exposing the ink tracing on blueprint paper to light in the blueprint machine, then taking the print and running it face down through the Ozalid developer, a machine where ammonia fumes react with the print paper, thus providing a white background with red lines.

.... 99. In making an ink tracing, it is important to keep all ink lines clear, sharp, and black, fairly heavy and of uniform weight.

....100. A fairly strong solution of ammonia is exceptionally good for cleaning ink from inking instruments.

Key

1. F	26. T	51. F	76. F
2. T	27. F	52. F	77. F
3. T	28. F	53. T	78. T
4. F	29. F	54. F	79. T
5. F	30. T	55. T	80. T
6. T	31. T	56. T	81. T
7. T	32. T	57. T	82. F
8. F	33. T	58. F	83. F
9. F	34. T	59. T	84. F
10. T	35. F	60. F	85. T
11. F	36. F	61. T	86. F
12. F	37. T	62. T	87. F
13. T	38. T	63. T	88. T
14. F	39. T	64. F	89. T
15. T	40. F	65. F	90. T
16. F	41. T	66. T	91. T
17. F	42. T	67. F	92. T
18. T	43. T	68. T	93. T
19. F	44. F	69. T	94. F
20. T	45. T	70. F	95. T
21. F	46. T	71. T	96. F
22. T	47. F	72. T	97. T
23. T	48. T	73. F	98. F
24. T	49. T	74. F	99. F
25. T	50. T	75. F	100. T

WOODWORKING TOOLS TEST

G. L. Simnicht, High School, Elk River, Minnesota

Directions: Write the name of the tool or part of the tool in the blanks.

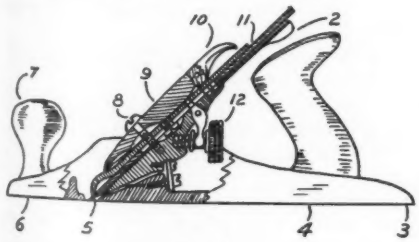


Fig. A

1. Figure A is a .....
2. No. 2 in Figure A is the.....
3. No. 3 in Figure A is the .....
4. No. 4 in Figure A is the .....
5. No. 5 in Figure A is the .....
6. No. 6 in Figure A is the .....
7. No. 7 in Figure A is the .....
8. No. 8 in Figure A is the .....
9. No. 9 in Figure A is the .....
10. No. 10 in Figure A is the .....
11. No. 11 in Figure A is the .....
12. No. 12 in Figure A is the .....

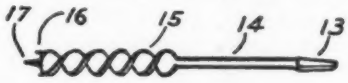


Fig. B

12. Figure B is an .....
13. No. 13 in Figure B is the .....
14. No. 14 in Figure B is the .....
15. No. 15 in Figure B is the .....
16. No. 16 in Figure B is the .....
17. No. 17 in Figure B is the .....
18. Figure C is a .....
19. No. 19 in Figure C is the .....
20. No. 20 in Figure C is the .....
21. Figure D is a .....
22. No. 22 in Figure D is the .....
23. No. 23 in Figure D is the .....
24. No. 24 in Figure D is the .....
25. No. 25 in Figure D is the .....

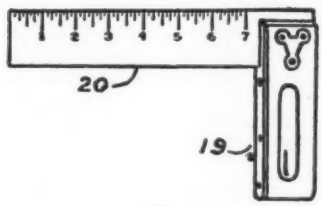


Fig. C

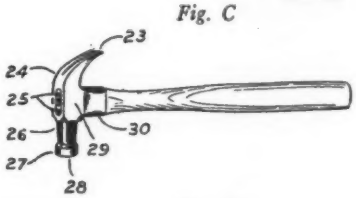


Fig. D

26. No. 26 in Figure D is the .....
27. No. 27 in Figure D is the .....
28. No. 28 in Figure D is the .....
29. No. 29 in Figure D is the .....
30. No. 30 in Figure D is the .....

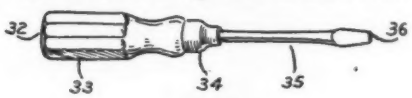


Fig. E

31. Figure E is a .....
32. No. 32 in Figure E is the .....
33. No. 33 in Figure E is the .....
34. No. 34 in Figure E is the .....
35. No. 35 in Figure E is the .....
36. No. 36 in Figure E is the .....

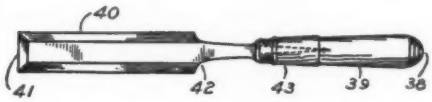


Fig. F

37. Figure F is a .....
38. No. 38 in Figure F is the .....
39. No. 39 in Figure F is the .....
40. No. 40 in Figure F is the .....
41. No. 41 in Figure F is the .....
42. No. 42 in Figure F is the .....
43. No. 43 in Figure F is the .....

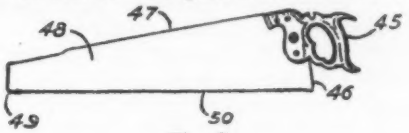


Fig. G

44. Figure G is a .....
45. No. 45 in Figure G is a .....
46. No. 46 in Figure G is a .....
47. No. 47 in Figure G is a .....
48. No. 48 in Figure G is a .....
49. No. 49 in Figure G is a .....
50. No. 50 in Figure G is the .....

Perfect score is 50. Your score is.....

Key

1. Smoothing plane	26. Neck
2. Lateral adjusting lever	27. Poll
3. Heel	28. Face
4. Sole	29. Cheek
5. Mouth	30. Adze eye
6. Toe	31. Screw driver
7. Knob	32. Head
8. Lever-cap screw	33. Handle
9. Lever cap	34. Ferrule
10. Cam	35. Blade
11. Plane iron	36. Tip
12. Adjusting nut	37. Chisel (wood)
12. Auger bit	38. Head
13. Tang	39. Handle
14. Shank	40. Beveled-edge blade
15. Twist	41. Cutting edge
16. Spur	42. Shoulder
17. Lead screw	43. Socket
18. Try square	44. Hand saw
19. Handle	45. Handle
20. Blade	46. Heel
21. Claw hammer	47. Back
22. Handle	48. Blade
23. Claws	49. Toe
24. Head	50. Teeth
25. Wedges	

WOOD-FINISHING EXAMINATION

Herbert K. Iverson, Lincoln High School, Seattle, Washington

Part III. Procedure-Arrangement

Directions: Below are several steps of an operation each of which is not in its proper sequence. You are to arrange the numbers of the listed steps into their proper sequence in the parentheses below each item.

Example: To Apply Oil Stain:

1. Dip the brush into the stain about one fourth of the length of the bristles.
2. Mix the stain thoroughly if it is a pigment stain.
3. Select the desired color.
4. Wipe the surface with a clean rag to produce an even surface.
5. Apply the stain evenly and rapidly.
6. Clean the brush carefully.
7. Return all tools and materials to their proper places.

Correct order: (3) (2) (1) (5) (4) (6) (7)

To Apply Water Stain:

1. Sponge the surface to be stained.

2. Select the desired color.
3. Dip the brush in the stain about one fourth the length of the bristles.
4. Brush out the laps and streaks quickly before the stain dries.
5. Sand the sponged surface lightly after the stain has dried.
6. Clean the brush in hot water.
7. Apply the stain with a brush.

Correct order: ( ) ( ) ( ) ( ) ( ) ( ) ( )

To Apply Varnish:

1. Select the proper brush.
2. Pour out a sufficient quantity of the varnish into a clean cup.
3. Load the brush quite heavily by dipping it in the varnish.
4. Apply the varnish by brushing it from the inside toward the outside.
5. Tap off the surplus on the edge of the can.
6. Clean the brush thoroughly in turpentine.
7. Select the proper varnish.

Correct order: ( ) ( ) ( ) ( ) ( ) ( ) ( )

To Apply Lacquer:

1. Apply a thin coat of lacquer.
2. Select a good quality brush.
3. Prepare the surface by sanding carefully with the grain.
4. Flow on the lacquer.
5. Select the proper color.
6. Load the brush quite heavily by dipping in the lacquer.
7. Clean the brush with lacquer thinner.

Correct order: ( ) ( ) ( ) ( ) ( ) ( ) ( )

To Remove Varnish:

1. Select a rubber set brush.
2. Shake the solvent well and pour a portion in a suitable receptacle.
3. Remove the waste material with a dull scraper.
4. Let the solvent stand for three to five minutes.
5. Flow on a wash coat.
6. Remove all hardware drawers and glass.
7. Brush the solvent on the article.

Correct order: ( ) ( ) ( ) ( ) ( ) ( ) ( )

Finishing a Chest With Oil Varnish Using a Water Stain:

1. Apply the filler.
2. Sponge the surfaces to be stained.
3. Sandpaper the job.
4. Apply the stain.
5. Apply the first coat of varnish.
6. Put away tools and equipment.
7. Sand the sponged surfaces.
8. Remove the dust.
9. Allow the sponged surface to dry.
10. Apply the sealing coat.
11. Apply the succeeding coats of varnish.
12. Lightly sand the varnish.
13. Rub with pumice and oil.
14. Polish with rottenstone.

Correct order: ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )

Finishing a Chest With Clear Lacquer Using an Oil Stain:

1. Apply the sanding sealer.
2. Sandpaper the job.
3. Apply the stain.
4. Apply the filler.
5. Remove the dust.
6. Sandpaper the sanding sealer.
7. Apply the lacquer.
8. Put away the tools and equipment.
9. Polish with rottenstone.
10. Rub with pumice and oil.

Correct order: ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( ) ( )

Part IV. Word Matching

Directions: Below are two columns of words related in meaning. Write the numbers of the words in the left column on the space to the left of the words in the other column so that they will show the items which are related. The first one is done as an example.

1. Oil stain	.. 3 ..Nitrocellulose
2. Paste filler	.....Polishing agent
3. Lacquer	.....Silex
4. Water stain	.....Copal gums
5. Rottenstone	.....Aniline dyes
6. Liquid filler	.....Alcohol
7. Shellac	.....Flax seed
8. Linseed oil	.....Volcanic ash
9. Pumice	.....Fir
10. Varnish	.....Turpentine
11. Spirit stain	.....Refinishing
12. Sandpaper	.....Nibs
13. Naphtha	
14. Dust	
15. Felt	

Part V. Multiple-Choice

Directions: Each of the sentences below is finished correctly by adding one of the words below the statement. Determine which of the words will best complete the meaning of the sentence and insert it in the space provided. At the same time place the number of the word on the space to the left of the statement, as in the example.

Example:

C Lacquer should be allowed to dry at least two hours.
(*a*) six (*b*) eight (*c*) two (*d*) twenty-four

..... 1. Shellac is thinned with .....
(*a*) turpentine (*b*) water (*c*) gasoline (*d*) alcohol

..... 2. Varnish brushed should be cleaned in .....
(*a*) turpentine (*b*) kerosene (*c*) naphtha (*d*) alcohol

..... 3. The body of filler is composed of .....
(*a*) chalk (*b*) silex (*c*) wood dust (*d*) stone

..... 4. Filler is thinned with .....
(*a*) water (*b*) benzol (*c*) turpentine (*d*) naphtha

..... 5. Lacquer is ..... on the surface.
(*a*) brushed (*b*) flowed (*c*) laid (*d*) poured

..... 6. Lacquer dries by .....
(*a*) oxidation (*b*) evaporation (*c*) heating (*d*) chemical action

..... 7. Filler should be thinned to the consistency of thin .....
(*a*) cream (*b*) paint (*c*) stain (*d*) paste

..... 8. An open-grain wood is .....
(*a*) gum (*b*) maple (*c*) mahogany (*d*) fir

..... 9. ..... stain is the best of all stains to apply.
(*a*) spirit (*b*) oil (*c*) water (*d*) varnish

.....10. The base of a high-quality varnish is made from .....
(*a*) silex (*b*) lac (*c*) resin (*d*) fossil gums

.....11. The best material for rubbing a clear finish is .....
(*a*) pumice (*b*) rottenstone (*c*) sandpaper (*d*) emery cloth

.....12. Lacquer should never be applied directly over a surface finished in .....
(*a*) water stain (*b*) lacquer enamel (*c*) paint (*d*) shellac

.....13. End grain should have ..... applied to it before using an oil stain.
(*a*) gasoline (*b*) turpentine (*c*) water (*d*) benzol

.....14. Shading stain should be ..... stain.
(*a*) water (*b*) spirit (*c*) oil (*d*) varnish

COMPLETION TEST

Fred. W. Weyer, Los Angeles, California

Questions based on Hjorth's *Principles of Woodworking**

1. Measuring tapes are made of ..... and .....

2. A 45-deg. angle can be laid out with a .....

3. The 24-in. part of a steel square is called the .....; the 16-in. part is called the .....

4. The ..... on a steel square is used to read off the number of board feet without calculation.

5. The terms *run*, *rise*, and *pitch* refer to a .....

6. A mortise can best be laid out with a .....

7. *Plumb glasses* are used in the ..... to determine the position of a post or beam.

8. The length of the jackplane is ..... in.

9. The ..... is used for planing rabbets on the edge of a board.

10. The ..... of a chisel enters the handle.

11. The ..... chisel is shorter in the blade for inaccessible work.

12. The ..... of a chisel is the narrow upper part of the blade.

*Published by The Bruce Publishing Co., Milwaukee, Wis.

13. Holes to be bored larger than 1 in. are usually bored with the ..... bit.
14. The top end of a hole for a flathead screw is widened with a .....
15. The latest type of swing cutoff saw is the ..... type.
16. The ..... saw has a stationary and movable table.
17. The threads on a circular saw arbor are ..... handed.
18. Four uses for fences or gauges on a universal saw are: *a*) ....., *b*) ....., *c*) ....., *d*) .....
19. The adjustment and gauge used to cut a compound miter are .....
20. The cutters of a dado saw are called *a*) ....., *b*) .....
21. Blue patches called *bulls-eyes* are found on ..... caused from overheating.
22. The part of the machine used in ripping to prevent pinching and kick back is called the .....
23. The ..... is used as a guide when ripping or cross cutting .....
24. The ..... wheel of a band saw is movable vertically and can be tilted for adjustment.
25. The teeth of a band saw are shaped like those of a .....
26. If the rear table of a jointer is too high, it will cut more off the ..... end of a board.
27. Jointers are useful in straightening the surfaces of ..... boards.
28. Pieces less than ..... in. in length should not be planed on the jointer.
29. A planer or surfacer that can plane both surfaces at the same time is called a ..... surfacer.
30. The ..... side of a board is placed on the bed of a single surfacer after being taken out of wind.
31. The chain mortiser is equipped with a cutter that is shaped like .....
32. Work on the shaper can be run with or against the grain because of .....
33. Grinding on an automatic knife grinder is controlled by a .....
34. The back surface of trimmer knives should be ground .....
35. When the teeth of a saw are damaged or uneven, the saw should be .....
36. ..... is used on a grindstone to prevent burning and to wash away refuse from the grinding.
37. A ..... is used to finish the edge of a cabinet scraper.
38. The ..... of a scraper is flattened before grinding.
39. The nibs are a part of the .....
40. When a rasp or file is cleaned it is dipped in ..... before burning.
41. Circular saws filed with square gullets will .....
42. Miter and dado circular saws are ..... instead of being set for clearance.
43. ..... is used for brazing band saws as a flux.
44. High-speed cutter heads should be ..... by using knives of the same weight.
45. A board to be squared to dimensions is first planed on the .....
46. The working surface of a board is tested with a .....
47. The ..... is used to finish cross-grained and curly wood.
48. A back saw is best started in a dado cut by ..... the mark with a .....
49. A gained joint or blind dado is used on .....
50. The ..... is used to machine dadoes, rabbets, and grooves on circular work.

Key

1. cloth, steel
2. miter square
3. blade, tongue
4. board measure table
5. roof or stair
6. mortising gauge
7. level
8. 14 or 15
9. rabbet plane
10. tang
11. butt
12. shank
13. expansive
14. countersink
15. motor-on-arbor
16. universal
17. left
18. *a*) ripping, *b*) crosscutting, *c*) miter cutting, *d*) segment work
19. tilt the table and use the universal gauge
20. *a*) inside, *b*) outside
21. circular saws
22. spreader
23. fence, short blocks
24. upper
25. ripsaw
26. front
27. warped
28. 12
29. double
30. smooth
31. the teeth of a saw
32. the high speed of rotation
33. sliding table
34. flat
35. jointed
36. water
37. burnisher
38. hooked edge
39. auger bit
40. alcohol
41. crack
42. hollow ground
43. borax
44. balanced
45. face
46. try square
47. cabinet scraper
48. scoring, knife
49. open-faced shelves
50. shaper

MULTIPLE-CHOICE TEST

Fred. W. Weyer, Los Angeles, California

Questions based on Hjorth's *Principles of Woodworking*

Directions: From the several suggested answers which accompany each of the following unfinished statements, choose the best answer and place the number preceding it in the blank space before the statement.

..... 1. The measuring tool used by the woodworker is a (1) triangular scale rule, (2) calipers, (3) folding type rule.

..... 2. The angles for cutting a rafter are obtained with a (1) triangle, (2) T bevel, (3) steel square.

..... 3. A marking gauge is used for gauging (1) thickness of the board, (2) parallel lines, (3) length of a saw cut, (4) laying out a circle.

..... 4. The inside and outside diameters of wood turnings are measured with a (1) folding rule, (2) depth gauge, (3) inside and outside calipers, (4) micrometer.

..... 5. A surveyor's instrument is placed above a point by the use of a (1) level, (2) plumb bob, (3) the chain man, (4) the surveyor.

..... 6. The number of points to the inch refers to the (1) steel square, (2) marking gauge, (3) rip saw, (4) trammel points.

..... 7. A back saw is used for (1) ripping a board, (2) cutting a circle, (3) cutting a tenon.

..... 8. The intersection of moldings on the inside of an angle are cut with a (1) miter saw, (2) compass saw, (3) coping saw.

..... 9. The frog is a part of a (1) brace, (2) plane, (3) marking gauge, (4) miter box.

.....10. The wood between two saw cuts is best removed with a (1) chisel, (2) smoothing plane, (3) router plane.

.....11. Veneers and highly figured woods are finished before sanding with a (1) smoothing plane, (2) rasp, (3) cabinet or hand scraper.

.....12. A chisel with a slender blade and beveled sides is called a (1) straight gouge, (2) firmer chisel, (3) socket mortise chisel, (4) paring chisel.

.....13. An auger bit 4½ in. long is called a (1) twist bit, (2) ship auger, (3) dowel bit, (4) Forstner bit.

.....14. A chisel can best be driven into wood with a (1) claw hammer, (2) hatchet, (3) mallet.

.....15. The surface of a wood rasp is formed (1) dead smooth, (2) with rough triangular points, (3) oblique parallel cutters.

.....16. The type of saw used for cutting boards, planks and timbers into required rough lengths is a (1) dado saw, (2) circular trim saw, (3) swing cutoff saw.

.....17. The type of saw that is most useful is a (1) swing cutoff saw, (2) bench saw, (3) circular saw.

.....18. Boards over 12 in. wide are cut off on a (1) swing cutoff saw, (2) universal circular saw.

.....19. When cutting off short blocks, the operator should use a (1) ripping fence, (2) cutoff gauge with iron block, (3) rolling table with cutoff gauge.

.....20. When applying dado saws with a larger hole than the size of the arbor, the part used to correct this is called (1) dado collars, (2) dado extension sleeve, (3) dado head.

.....21. Pieces are thrown violently

back from a power saw because of (1) insufficient pressure by operator, (2) improper sharpening and lack of set, (3) cross grain in wood.

.....22. The circular saw should be adjusted above the work (1) 2 in., (2) 1 in., (3) ⅛ in.

.....23. Safety in ripping narrow pieces is accomplished by (1) removing the guard, (2) use of a forked push stick, (3) freehand sawing.

.....24. A band saw can be tracked on the wheel by (1) tilting the table, (2) guide post, (3) tilting the top wheel.

.....25. Fine scroll-saw work can best be done with a (1) ½-in. band saw; (2) ¼-in. saw, plain back; (3) ⅛-in. saw with bevel back.

.....26. Safety demands that the modern cutter head for a jointer be (1) triangular, (2) round, (3) square.

.....27. The rear or outfeed table of a jointer should be (1) level, (2) below, (3) above the level of the knives at their highest point.

.....28. The operator is protected when using the jointer by use of (1) gloves, (2) pusher block.

.....29. Sectional feed rolls are a part of the (1) jointer, (2) band saw, (3) planer or surfacer.

.....30. Before surfacing a board on the planer, the board is taken out of *wind* by (1) band resawing, (2) hand planing, (3) jointing.

.....31. A chip breaker is found on the (1) dado saw, (2) planer, (3) jointer.

.....32. The hollow chisel of a mortising machine is fastened to the (1) arbor, (2) lower chuck, (3) spindle chuck.

.....33. A wood trimmer is used for (1) surfacing, (2) end matching, (3) mitering moldings.

.....34. Inside circular work can be sanded on a (1) disk sander, (2) drum sander, (3) spindle sander.

.....35. A hand saw is jointed with a (1) saw set, (2) emery wheel, (3) flat file.

.....36. A ripsaw is filed (1) to a knife point, (2) straight across to a chisel point, (3) before being set.

.....37. Inside and outside bevel gouges are whetted on a (1) conical grindstone, (2) whetstone, (3) slip stone.

.....38. The hand scraper is ground or filed (1) at right angles to the blade, (2) like a plane iron.

.....39. The nibs of an auger bit are filed on the (1) inside, (2) outside, (3) concave side.

.....40. Turning skew chisels are ground on (1) one face, (2) both faces.

.....41. The term *gumming* refers to (1) gluing up a table top, (2) plane irons, (3) filing a circular saw.

.....42. Large circular saws are set with a (1) hand-pressure saw set, (2) hammer and punch, (3) trip-hammer saw set.

.....43. Band saws are brazed with (1) copper solder, (2) rosin-core solder, (3) silver solder.

.....44. Jointed boards for gluing should be (1) open at the ends, (2) fitted at all points in the length, (3) a slight opening at the center.

.....45. Cross-grained woods like birch or mahogany and table tops are straightened up by hand by (1) scraping (2) cross planing, (3) planing from end to end.

.....46. The most useful joint in cabinetwork is a (1) half-lap joint, (2) grooved joint, (3) butt joint.

.....47. A dado joint is used for (1) joining a table leg with its apron, (2) on drawer fronts, (3) fastening shelves into divisions.

.....48. A router plane can be set to cut all dadoes (1) the same width, (2) at an angle, (3) the same depth.

.....49. The joint used in matched flooring is called (1) dado, (2) gain, (3) tongue-and-groove.

.....50. The backs of drawers are applied by use of a (1) butt joint, (2) mortise-and-tenon joint, (3) dado and tongued joint.

Key

1. 3	11. 3	21. 2	31. 2	41. 3
2. 3	12. 4	22. 3	32. 2	42. 3
3. 2	13. 3	23. 2	33. 3	43. 3
4. 3	14. 3	24. 3	34. 3	44. 3
5. 2	15. 2	25. 3	35. 3	45. 2
6. 3	16. 3	26. 2	36. 2	46. 2
7. 3	17. 3	27. 1	37. 3	47. 3
8. 3	18. 2	28. 2	38. 1	48. 3
9. 2	19. 2	29. 3	39. 1	49. 3
10. 3	20. 2	30. 3	40. 2	50. 3

Problems and Projects

WHISTLE

William J. Becker, Boynton Junior High School, Ithaca, New York

Almost any boy or girl wants a whistle. Whether it is used for refereeing some game, or in connection with scout work, the blast of the one described in this article is quite adequate. By substituting a round cork instead of the dry pea listed in the instruction sheet, additional noise can be obtained.

Materials

2 pc. 1¼ by 1¼ in., disks
1 pc. 1 by 3¾ in., cylinder

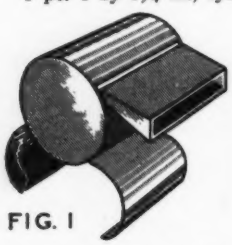


FIG. 1

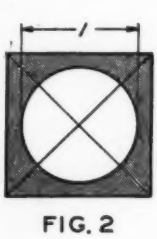


FIG. 2

1 pc. 1¼ by 3½ in., handle
1 pc. ⅝ by 1¾ in., mouthpiece

Directions

1. Make bill of material and have instructor approve.

2. Cut out stock as listed in bill of material.

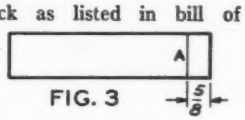


FIG. 3

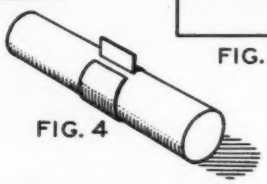


FIG. 4

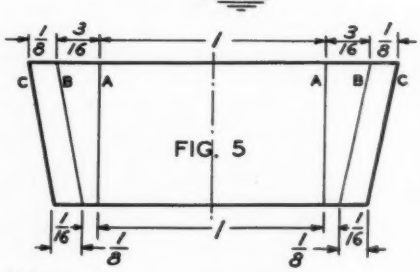


FIG. 5

Disks

1. Lay out disks as shown in Figure 2. Draw diagonal lines to locate center.

2. Cut out circle very carefully, using hand snips. File smooth, if necessary.

Cylinder

1. Lay out line *A* as shown in Figure 3.

2. Bend small portion at right angles to remainder of piece.

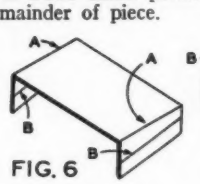


FIG. 6

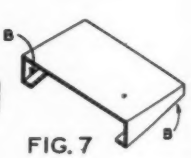


FIG. 7

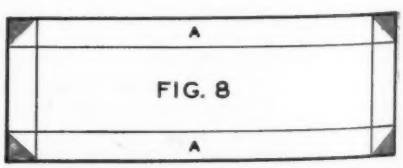


FIG. 8

3. Using a 1-in. round bar of iron, bend piece as shown in Figure 4.

Mouthpiece

1. Lay out lines shown in Figure 5. Draw

lines in following order: Center line, *A, B, C.* Cut out along *C.*

2. Make bends at *A*, Figure 6. Make bends over stake and at right angles.

3. Make double ⅛-in. hem parallel to both long sides. (*AA* in Fig. 8.)

4. Using stake or round bar of metal, round ends as shown in Figure 9. Hems should be on the inside. Bend this piece to fit over your first and second finger.

Assembly

1. Solder disks in place inside the edges of the circle. *Caution:* Be sure to place the dry pea inside the cylinder before soldering the second disk in place. A round cork will function better than the dry pea. You could whittle one at home using a sharp knife.

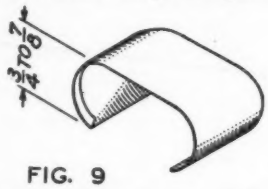


FIG. 9

2. Solder the mouthpiece and handle in place. (Fig. 1.)

3. Wash off the surplus flux, clean job with steel wool and adjust mouthpiece to secure maximum volume.

References

1. *Cold Metalwork Notebook,* Willoughby and Chamberlain, The Bruce Publishing Co., Milwaukee, Wis.

2. *Metalwork Essentials,* Tustison and Kranzusch, The Bruce Publishing Company, Milwaukee, Wis.

Questions

1. In what form is solder offered for sale? How is it sold? (Ref. 1, page 14.)

2. What is the cost of a pair of 6-in. dividers? 3-in. tinsnips? Ask instructor for tool catalog giving these prices.

3. Describe the circumference rule and tell where it is used. (Ref. 2, page 2.)

4. Give the nearest U. S. standard gauge equivalent to 1/32 in., 1/16 in., and ⅛ in. (Ref. 2, page 5.)

5. For what is the hawkbill snips used? (Ref. 2, page 15.)

AN ALL-WOOD BEDSIDE LAMP

Wilbur F. Douglass, Long Beach, California

The attractive bedside lamp shown in the accompanying illustrations, was one of three made by the author from the main stem of an araucaria tree that had been cut down to make room for some new construction.

Araucarias are coniferous trees, sometimes found in extensive forests, that grow in South America, Polynesia, and Australia. Three species of the dozen that make up this odd genus have been introduced as ornamentals into California where they are a familiar sight in parks and estates. These remarkably symmetrical trees go by the common names of the *Monkey Puzzle Tree,* the *Bunya-bunya,* and the *Norfolk Island Pine.* It was from a specimen of the latter (*Araucaria excelsa*) that these lamps were turned.

The characteristics of these trees that are of interest to the woodworker are the wood qualities and the manner of branching. In texture the wood is quite similar to sugar pine. The knots are hard, sound, and resinous. Each tree develops its branches in whorls, one each year. As a result, a node of the main stem will have buried in it a ring of knots, numbering from five to nine, with all the knots of each whorl on almost precisely the same level.

In constructing one of these lamps two short sections of a stem of the proper diameter are necessary. Each must contain a whorl of sound knots. As is evident from Figure 2, one section is used for the main part of the lamp base and the other for the shade. Any resinous tree with wood of the proper character and the branches in whorls can be used in the same manner as the different species of araucarias.

The base is glued to a flat piece of hardwood, in this case a Brazilian wood, rich cherry red in color, called *incienso* because of its fragrance in the raw state. The ventilating disk that supports the shade is of the same wood. Surrounding the upper part of the base is a collar of manzanita burl obtained from the root of this chaparral shrub. The ring that forms the lower edge of the shade is also turned from this burl. Obviously, any

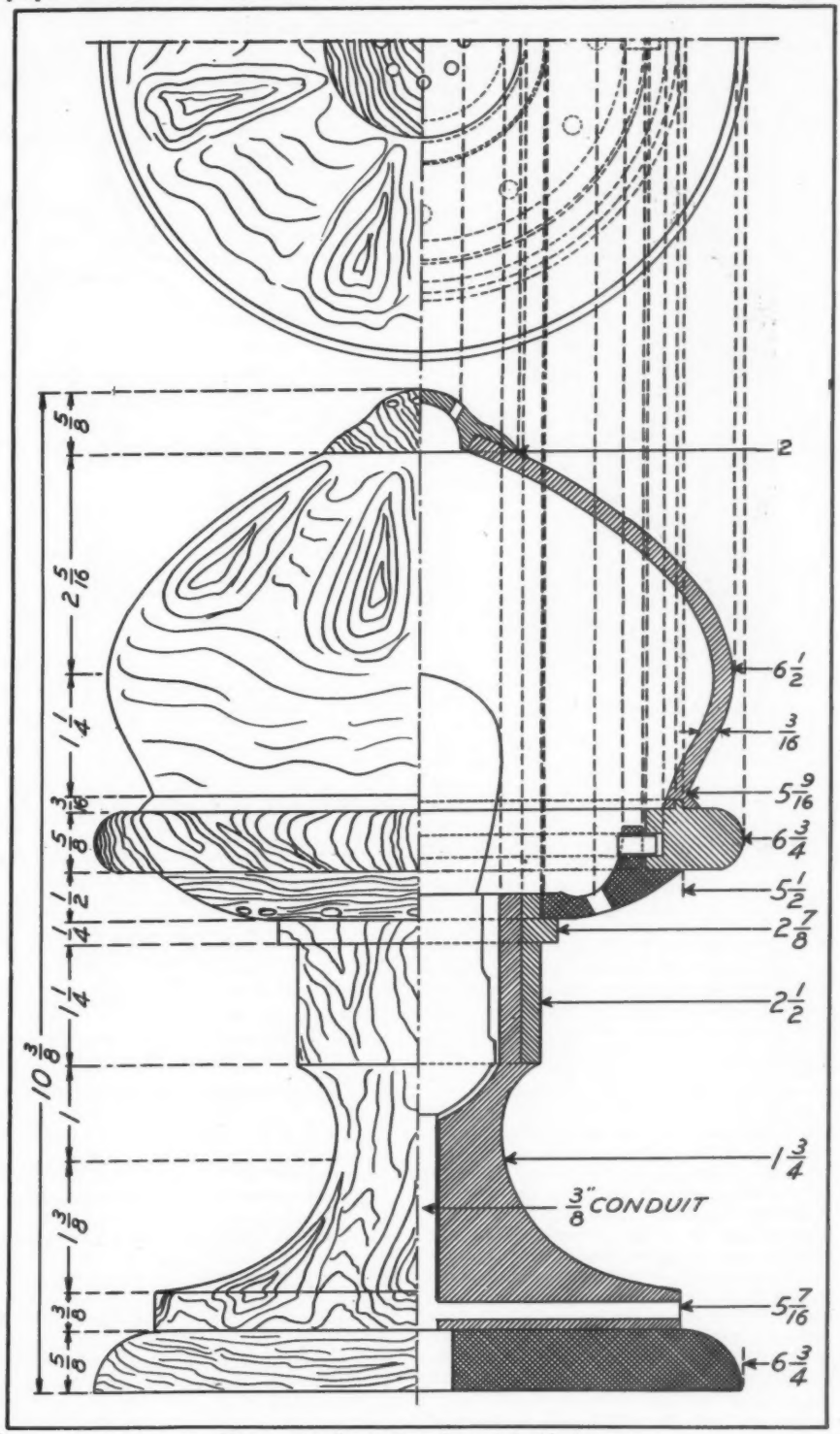


Fig. 2. Details of the all-wood beside lamp

other hardwood of suitable grain and color may be substituted for this relatively unknown but beautiful wood. The ventilating button at the top of the shade can be quickly turned from any sound white pine knot of sufficient size.

It need scarcely be said that the difficult part of this project is the turning of the shade. Since the spectacular beauty of the finished lamp when in use is dependent upon the translucent character of the resinous knots and, to a lesser extent, the intervening wood, it must be turned to a uniform thickness of 3/16 in. This requires the skill of the patternmaker. One false move and a nearly finished shade will blow up like a bomb. Much of the difficulty and the need for caution are due to the great variation in hardness between the knots and the intervening wood.

Fig. 1. All-wood beside lamp

After "roughing in" the section from which the shade is to be turned, it should be cut off on the lathe in order to get a perfectly square end. A faceplate is fastened to the end grain on the end which is to be the top of the shade. Enough wood must be allowed so that the screw holes will not penetrate too close to where the finished surface of the shade will be. In utilizing the whorl, the knots should be just above the greatest diameter of the shade so that the shade's receding surface will give them the most pleasing shape.

Using the faceplate, the inside of the shade can now be excavated. Since the outside must later be turned without access to the interior, accurate templates should be cut from manila cardboard and the interior turned in strict accordance with the inside template.

In the meantime, the ring which is to be fitted and glued to the lower edge of the shade should be laid out, glued to a block on another faceplate, and turned. When it and the lower edge of the shade are carefully fitted they should be glued together and left squeezed in the lathe overnight. Now the faceplate on the upper end of the shade can be removed and the outside of the shade turned. After this operation is completed, the button for the top of the shade, with its inner surface turned, can be inserted. The outside of the button is then turned and the completed shade polished before cutting it from the faceplate block.

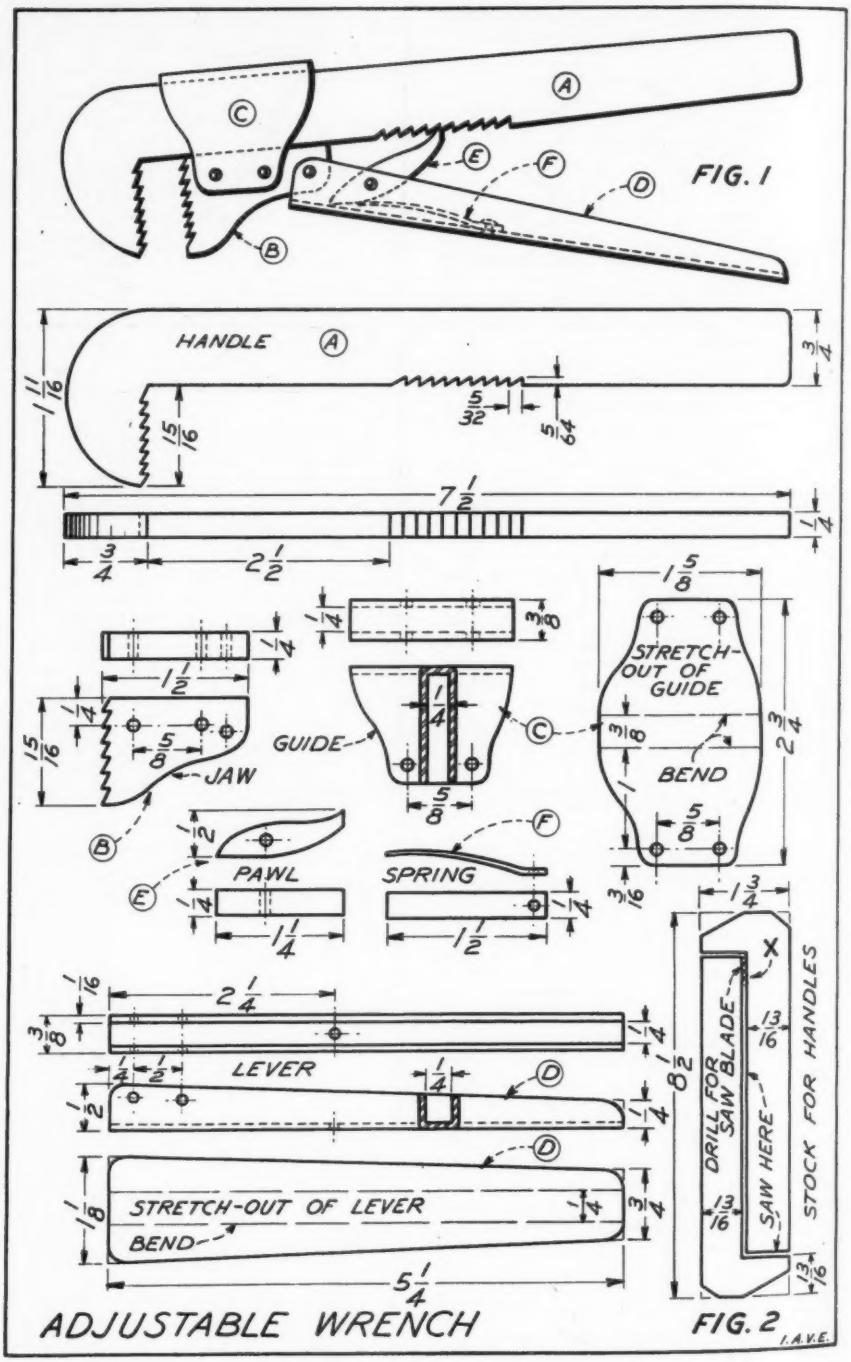
A good grade of lacquer, put on both the outside and inside with an air gun is the best finish because of its heat-resisting qualities. The lamps made by the author have shown no tendency to crack or craze.

The novelty which we are describing is very attractive even under daylight conditions, but when the ten-watt globe within is turned on in a darkened room, the rich, ruddy glow that illumines every detail of the graining in the wood gives it a beauty that is rare indeed. Even the tiny ventilators in the top button act as so many pinhole cameras and throw multiple images of the globe filaments in a circle on the ceiling.

ADJUSTABLE WRENCH

L. C. Petersen, State Teachers College, Carbondale, Illinois

The wrench shown in Figure 1 has proved to be very popular because it is convenient, strong, and quickly adjusted to any desired size. It is useful for turning nuts, screws, and pipes of various sizes. The toggle joint makes it possible to get a grip on the object that knows no slipping. The wrench is designed so that it may be made in the school shop with few tools. Its construction offers the student a means of gaining expe-



Details of adjustable wrench

rience in performing several fundamental operations such as laying out, sawing, filing, drilling, riveting, fitting, and polishing.

Design of Wrench. The drawing shows that the main part is the handle *A* on which slides the jaw *B*, supported by the guide *C*. The lever *D* is hinged on jaw *B* and contains the pawl *E* which swings on a pin, and is directed by the spring *F* so as to engage with the notches in handle *A*. The jaws may be separated by increasing the angle between lever and handle to disengage the pawl.

Operation of Wrench. To operate the wrench, push jaw *B* by means of lever *D* toward the jaw on *A* to grip the object that is to be turned. The pawl *E*, fitting into a notch on *A*, serves as a stop, while pressure on lever *D* and handle *A* forces the jaws together and affords a tight grip on the object.

Construction of Wrench

1. To make handle *A*, take a piece of mild steel, ¼ by 1¾ by 8½ in. This is enough for two handles. Draw an outline of the handles on the steel and make saw cuts as shown in Figure 2. In order to start the hack saw to make the lengthwise cut, drill a series of small holes as shown at *X* and, with a chisel, cut out the surplus material to make room for the hack-saw blade. Shape the jaw with a hack saw and file. Lay out and file the notches on the handle and jaw.

2. To make jaw *B*, take another piece of mild steel, ¼ by 1 by 1½ in., and saw and file to the shape shown in the drawing.

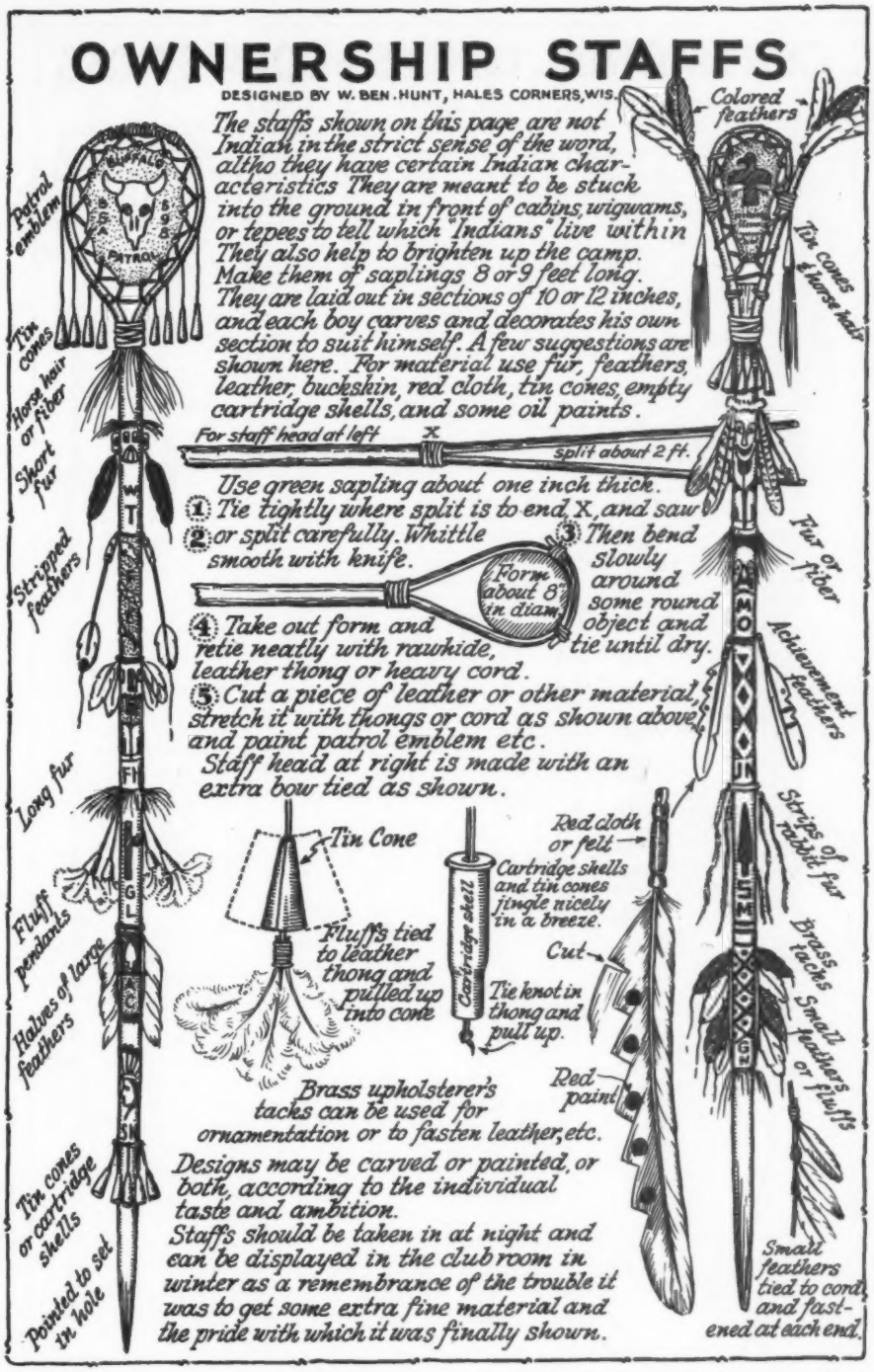
3. To make guide C, take mild steel, 1/16 by 1⅝ by 2¾ in. Cut it to its approximate shape by means of a hack saw, as is shown in the stretch-out. Bend on the lines to the U shape shown by the section view and file to the shape shown in drawing *D*. Fit it onto handle *A* and jaw *B*, drill holes, and fasten to *B* by rivets. The rivet may be made from a piece sawed from a 10d nail.

4. To make the lever *D*, take mild steel, 1/16 by 1¼ by 5¼ in. Cut to shape as shown in the stretch-out, and bend to a U shape as is shown in the section view. File to the finished shape. Fit onto jaw *B* and drill holes.

5. To make pawl *E*, take mild steel, ¼ by ⅜ by 1⅜ in. Drill the hole and finish to shape by means of hack saw and file, and caseharden. Fit it into the lever and rivet.

6. To make spring *F*, take a worn-out hack-saw blade, anneal it, and file it to the shape as shown in the drawing. Give it the required bend, harden and temper it in oil. Fit in place in the lever, drill a hole in the lever, and fasten it in place with a rivet. A 2d nail may be used as a rivet.

7. Go over the entire wrench in order to make all the parts work smoothly. File off all sharp edges and polish to a bright finish. Caseharden the notches in the jaws and handle, and the wrench is ready for use.


OWNERSHIP STAFFS
DESIGNED BY W. BEN. HUNT, HALES CORNERS, WIS.
The staffs shown on this page are not Indian in the strict sense of the word, altho they have certain Indian characteristics They are meant to be stuck into the ground in front of cabins, wigwams, or tepees to tell which "Indians" live within They also help to brighten up the camp. Make them of saplings 8 or 9 feet long. They are laid out in sections of 10 or 12 inches, and each boy carves and decorates his own section to suit himself. A few suggestions are shown here. For material use fur, feathers, leather, buckskin, red cloth, tin cones, empty cartridge shells, and some oil paints.
Colored feathers
Tin cones & horse hair
Patrol emblem
Tin cones
Horse hair or fiber
Short fur
Striped feathers
Long fur
Fluff pendants
Halves of large feathers
Tin cones or cartridge shells
Pointed to set in hole
For staff head at left
X
Split about 2 ft.
Use green sapling about one inch thick.
1 Tie tightly where split is to end X, and saw
2 or split carefully. Whittle smooth with knife.
3 Then bend slowly around some round object and tie until dry.
Form about 8" in diam.
4 Take out form and retie neatly with rawhide, leather thong or heavy cord.
5 Cut a piece of leather or other material, stretch it with thongs or cord as shown above, and paint patrol emblem etc.
Staff head at right is made with an extra bow tied as shown.
Fur or fiber
Achievement feathers
Strips of rabbit fur
Brass tacks
Small feathers or fluffs
Tin Cone
Fluffs tied to leather thong and pulled up into cone
Cartridge shell
Red cloth or felt
Cartridge shells and tin cones jingle nicely in a breeze.
Cut
Tie knot in thong and pull up.
Red paint
Brass upholsterer's tacks can be used for ornamentation or to fasten leather, etc.
Designs may be carved or painted, or both, according to the individual taste and ambition.
Staffs should be taken in at night and can be displayed in the club room in winter as a remembrance of the trouble it was to get some extra fine material and the pride with which it was finally shown.
Small feathers tied to cord and fastened at each end.

USE NATIVE WOODS

Stephen J. Smith, Snohomish, Washington

School-shop instructors and supervisors find that materials for woodshops involve considerable sums of money. The first investment is the outright purchase of materials which are paid for after students use them. The second investment is the holdover from one year to the next, or until students are able to utilize all stock that has been ordered. In some cases, this may be several years after the purchase. Every tree-growing community in the United States presents opportunities for eliminating or greatly reducing such investments.

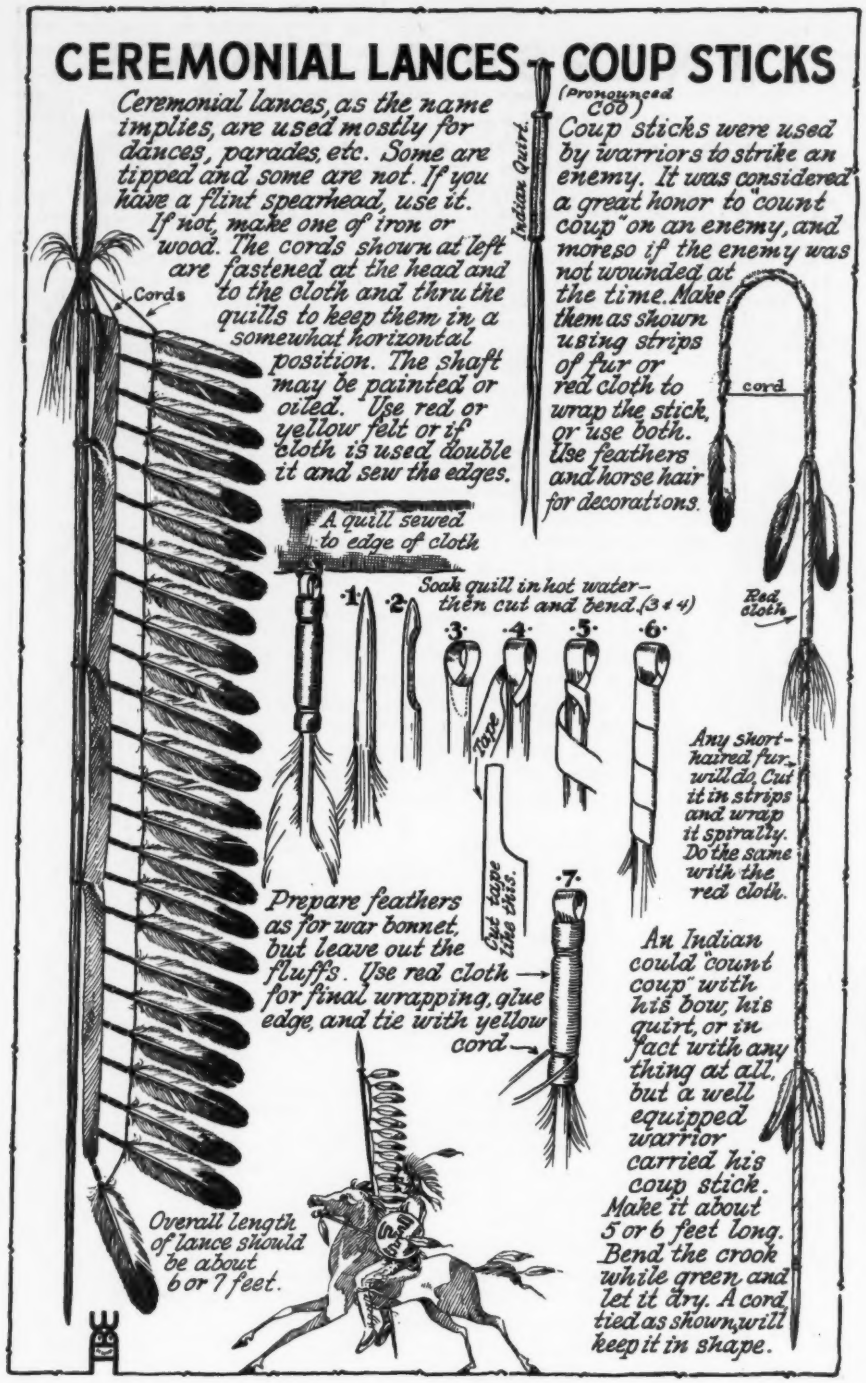
Students in tree-growing communities, if given proper encouragement and direction, can obtain and process all of their woodshop material with the aid of ordinary school-shop equipment. The major difficulty is establishing the plan and example to stimulate students to the required activity so they will utilize the native materials right at hand.

Once the possibilities of local materials are realized by a few students, many others will be eager to do likewise. Thus, a real saving for the school board results, and it also saves money for the student. Frequently, too, superior material may be obtained in this way for little labor.

My students have brought in and cut thousands of feet of native woods into lumber from as many as twenty or twenty-five different species of trees. In addition to having fine lumber stock from which to make projects, they have the satisfaction of having obtained and processed their own lumber.

Students select, and cut, or trade for all or parts of the trees to obtain stock suitable for their projects. Pine, spruce, fir, walnut, oak, gum, and locust or any other hardwood may, in this way, be obtained. Once started, the idea takes on real proportions as accompanying pictures illustrate.

The logs or pieces may be cut on ordinary shop machinery. Some logs are only a few inches thick while some are more than a foot


CEREMONIAL LANCES
Ceremonial lances, as the name implies, are used mostly for dances, parades, etc. Some are tipped and some are not. If you have a flint spearhead, use it. If not, make one of iron or wood. The cords shown at left are fastened at the head and to the cloth and thru the quills to keep them in a somewhat horizontal position. The shaft may be painted or oiled. Use red or yellow felt or if cloth is used double it and sew the edges.
Cords
COUP STICKS
(Pronounced COO)
Coup sticks were used by warriors to strike an enemy. It was considered a great honor to "count coup" on an enemy, and more so if the enemy was not wounded at the time. Make them as shown using strips of fur or red cloth to wrap the stick, or use both. Use feathers and horse hair for decorations.
Indian Quirt
cord
A quill sewed to edge of cloth
Soak quill in hot water—then cut and bend. (3 & 4)
Red cloth
1
2
3
4
5
6
Tape
Any short-haired fur will do. Cut it in strips and wrap it spirally. Do the same with the red cloth.
Cut tape like this.
7
Prepare feathers as for war bonnet, but leave out the fluffs. Use red cloth for final wrapping, glue edge, and tie with yellow cord
An Indian could "count coup" with his bow, his quirt, or in fact with any thing at all, but a well equipped warrior carried his coup stick. Make it about 5 or 6 feet long. Bend the crook while green and let it dry. A cord tied as shown will keep it in shape.
Overall length of lance should be about 6 or 7 feet.

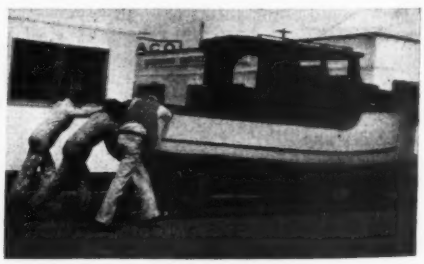
thick and may be as much as 22 ft. long. When the green slabs are cut into lumber, it is put into racks, providing adequate air spaces between to insure even drying. Wet lumber piled too tightly molds or sours. We have found those racks most successful which are located in unused ceiling spaces out of direct sunlight and where it is not too warm.

Some of the choicest lumber which we have been able to obtain anywhere has been obtained in this manner. Practically all of our choice boat stock, planking, and ribs, has been cut from local woods in this manner. It has saved the school and students many hundreds of dollars. It has also provided students with superior lumber for boat building. Such lumber, cut vertical grain, works more easily than kiln-dried stock, and bends under steam, pulling into place without splitting. This prevents slivers from mutilating the finished job when it is about ready for paint. It wears unusually well since the vertical grain takes up the shock from the soft portion on each side of the annual ring.

One of the practical points for this plan is that it provides an ample variety and quantity of choice woods for lathe work, figured burls for inlay on table tops, and novelty stock for individual or group projects where exceptional skill is being developed. What would many times be waste wood can be made into excellent stock. For example, consider the bulbous or burl and twisted growths which often manifest themselves as deformities on maple and walnut trees. As all craftsmen know, these deformities are really the most beautiful parts of a tree when sawed to obtain definite grain effects. These beautifully grained slabs are simply ideal stock for students with exceptional skill. Yet, unless such possibilities are pointed out to the uninitiated, these really choice pieces are thrown aside to rot, or they are burned as fuel.

Logs and slabs to be cut into shop lumber, principally cedar, for boats

In addition to saving money for school boards and students alike, obtaining lumber in this way develops many very desirable traits in students. Once the possibilities of



22-ft. cruiser on the way to its launching. Built by Lewis Patrio, a senior shop student. All of the hull and decking was made from vertical-grain split cedar

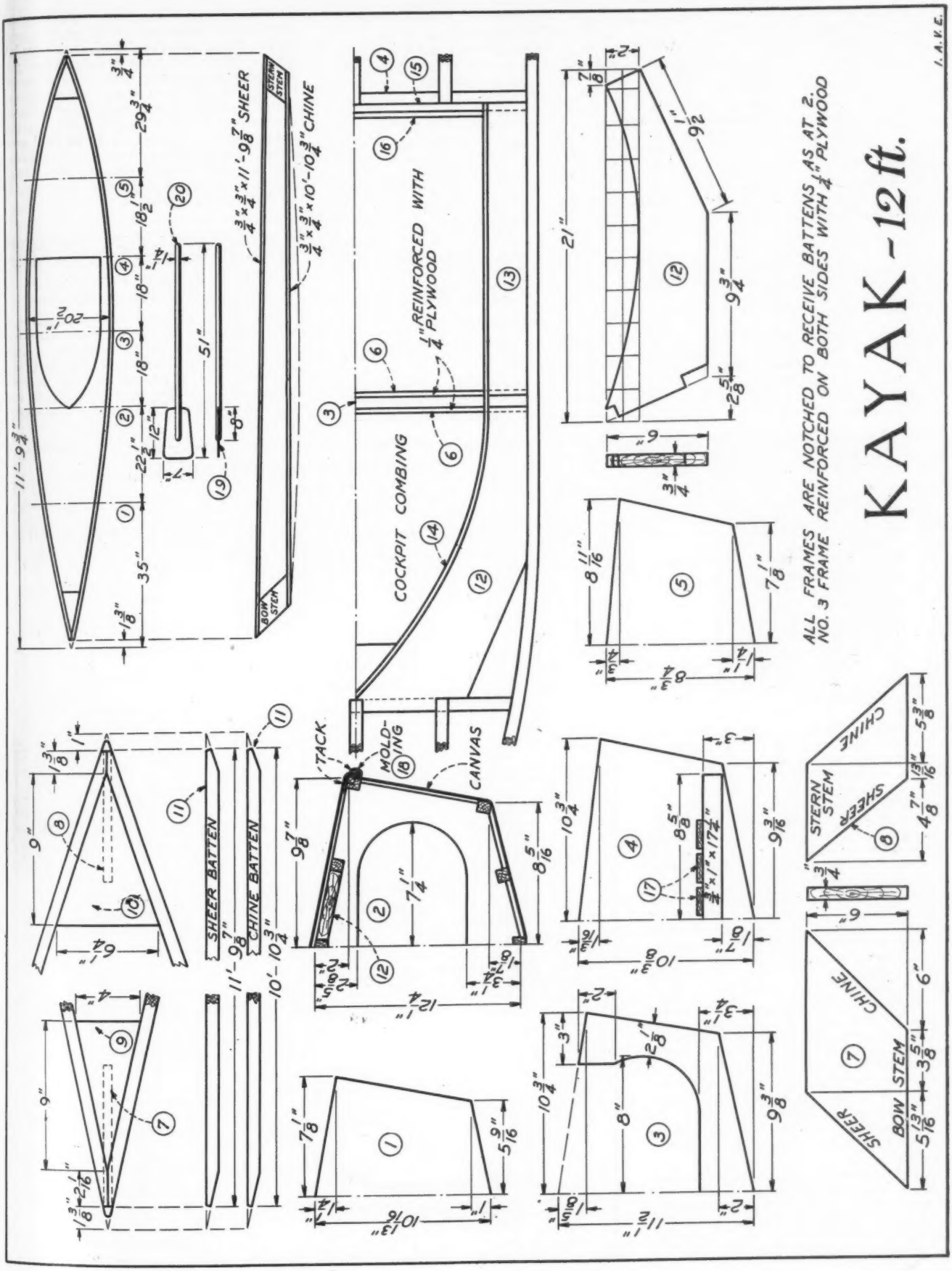
obtaining their own materials are realized, students take a great deal of justifiable pride in their ability to size up and utilize native materials. They see trees in a new light. Many students develop a valuable insight into the uses of a variety of native woods.

I have noticed, too, that when using lumber obtained in this way, students will be more ready to utilize every scrap of their native stock for some good purpose. Previously, they had to be watched to prevent needless waste of school-purchased materials. The bins of scrap stock rarely reveal the smallest piece of local woods cut by the students themselves. This transition alone is invaluable.

12-FT. KAYAK

James McGregor, Pasadena, California

The 12-ft. kayak, 22-in. beam, appeals to many boys. The main objective in working



Kayak designed by James McGregor, Pasadena, Calif.

Bill of Material

Part. No.	*No. Required*	*Material*	*Size*
1–5	1	Straight-grained spruce S2S	¾ x 12" x 8'
6	1	Douglas fir ply	¼ x 12 x 22"
7, 8	1	Straight-grained spruce	¾ x 6 x 30"
9, 10	1	Straight-grained spruce	¾ x 7 x 38"
11	11	Straight-grained spruce S4S	¾ x ¾ x 12'
12, 13	1	Straight-grained spruce S2S	¾ x 6" x 6' 9"
14	2	Straight-grained spruce S4S	¼ x 3 x 52"
15	1	Straight-grained spruce S4S	½ x 3 x 18"
16	1	Straight-grained spruce S4S	¾ x 1 x 18"
17	6	Douglas fir S4S	⅜ x 1¾ x 48"
18	2	Half-round redwood molding	¼ x ⅝" x 12'
19	2	Douglas fir ply	¼ x 7 x 12"
20	1	Douglas fir round pole	1¼ x 1¼" x 8'

1 pc.	10-oz. double-filled white-duck canvas 48" x 4 1/6 yd.	½ gal.	Boiled linseed oil
1 pc.	8-oz. single-filled white-duck canvas 29" x 4 yd.	½ gal.	Turpentine
8 doz.	F.h. brass screws 1½" No. 8	1/16 gal.	Pigment ground in oil
¾ lb.	Copper tacks 10 oz. x ⅝"	¼ gal.	Satin auto oil clear
1 lb.	Galvanized nails 7d box		
1 lb.	Galvanized nails 3d finish		
1 lb.	Casein waterproof glue		
12 lb.	Zinc compound		
1 qt.	Lesscoat (canvas filler)		

Painting Specifications

1 coat Lesscoat to seal the pores in canvas
2 coats zinc compound thinned with linseed oil and turpentine
1–2 coats satin auto oil clear, mixed with pigment ground in oil, 2 to 3 lb. pigment to 1 gal.

out this design has been to add variety and broaden experiences in this type of work for junior-high-school boys. The basic design, however, remains the same as in previous articles on the kayak appearing in this magazine, January, 1936, and May, 1937. More advanced types of construction could be used in a few cases, but the 12-ft. boat is fitted for the maturity of junior-high-school age, and also for the time available on most school programs.

The long sweeping lines and the narrowing of the beam give the boat greater advantage in choppy waters, and at the same time produces a speedy craft.

A boy weighing 110 lb. can be very comfortable in this boat, but above that weight a 14-ft. by 22-in. beam, 12-ft. by 24- to 26-in. beam, or a 10-ft. by 26-in. beam are recommended. By keeping in mind the weight of the student, a better margin of safety can be worked out, and it is well to have that margin.

The measurements in the drawing which accompanies this article have been taken from our full-sized plans and if followed carefully, a very accurate and well-balanced boat can be expected.

In paddling the kayaks, many people sit with their legs straight out and feet under the cockpit. By sitting with knees bent and feet resting against frame No. 2, greater leverage is obtained, as well as much better and more comfortable control over the paddle. More important, however, is the ease of getting out of the boat should it overturn. If both feet are under frame No. 2, there is the possibility that they may be caught should an upset occur.

The paddle is the double-bladed type, a half plan of which is shown in the drawing. The length given will be suitable for most boys, but sometimes a shorter or longer paddle will be better for certain individuals, depending upon the length of their reach.

A rectangular cockpit, although not as graceful, may be used instead of the pointed one.

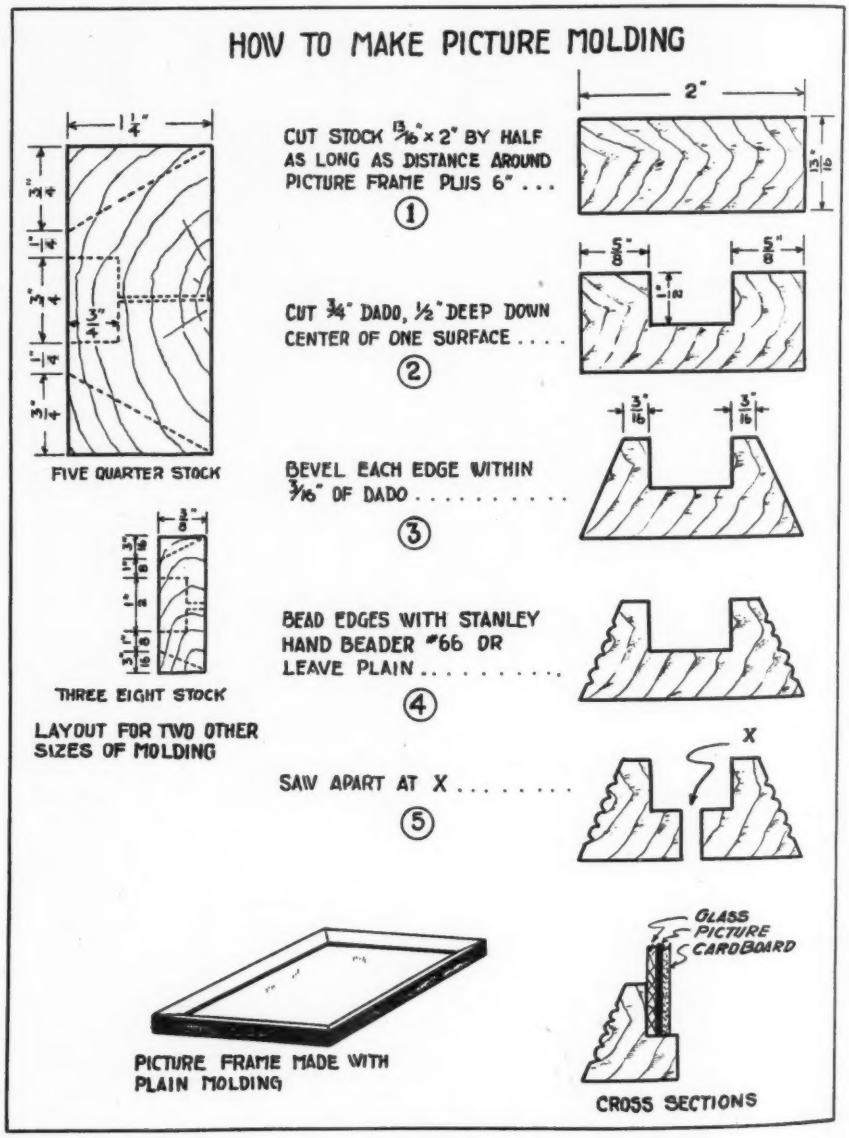
Straight-grained selected spruce has been used and is specially recommended for battens on fore and aft members, to prevent possible breakage or fracture in bending.

A cleat fastened on the bow is very useful to tie up the boat. Each individual has his own ideas of where he will use his boat, some at the lakes and others at the coast resorts. This kayak, like the others, is intended for comparatively smooth waters and not for ocean surf riding. Each body of water has its own oddities and may to all appearances be smooth and harmless, yet be quite treacherous. People who have lived at the location where the kayak is to be used very often know something about local conditions, and it is well to ask them for information before deciding upon the size and type of watercraft that is to be built.

MAKING SMALL PICTURE-FRAME MOLDING IN THE SCHOOL SHOP

Clifford K. Lush, Industrial-Arts Assistant, Minneapolis, Minnesota

The making of small picture frames is a very fine project for boys in woodworking or home-mechanics classes. It requires a great deal of accuracy in using the miter-box saw, in nailing, and in cutting glass. In machine woodworking, the making of molding is also a useful device for teaching the elementary


HOW TO MAKE PICTURE MOLDING
FIVE QUARTER STOCK
THREE EIGHT STOCK
LAYOUT FOR TWO OTHER SIZES OF MOLDING
CUT STOCK 13/16" x 2" BY HALF AS LONG AS DISTANCE AROUND PICTURE FRAME PLUS 6" . . .
1
CUT ¾" DADO, ½" DEEP DOWN CENTER OF ONE SURFACE . . . .
2
BEVEL EACH EDGE WITHIN 3/16" OF DADO . . . . . .
3
BEAD EDGES WITH STANLEY HAND BEADER #66 OR LEAVE PLAIN . . . . . .
4
SAW APART AT X . . . . . .
5
PICTURE FRAME MADE WITH PLAIN MOLDING
GLASS
PICTURE
CARDBOARD
CROSS SECTIONS

operations of the power saw, jointer, and shaper. Molding made by students in learning the use of such power tools may be made into picture frames by other classes, thus saving the material that might otherwise be discarded, were this to be merely a practice exercise. The method is illustrated in the accompanying illustrations.

The stock used will depend upon the quality of frame desired. Inexpensive frames may be made of pine or basewood, and finished with lamp black and shellac, or bronzed and antiqued with burnt umber oil color. Walnut frames in the natural finish are very beautiful. Many instructors prefer to do the wood finishing before sawing the two halves apart as directed in operation No. 5.

ARROW-FEATHERING JIG

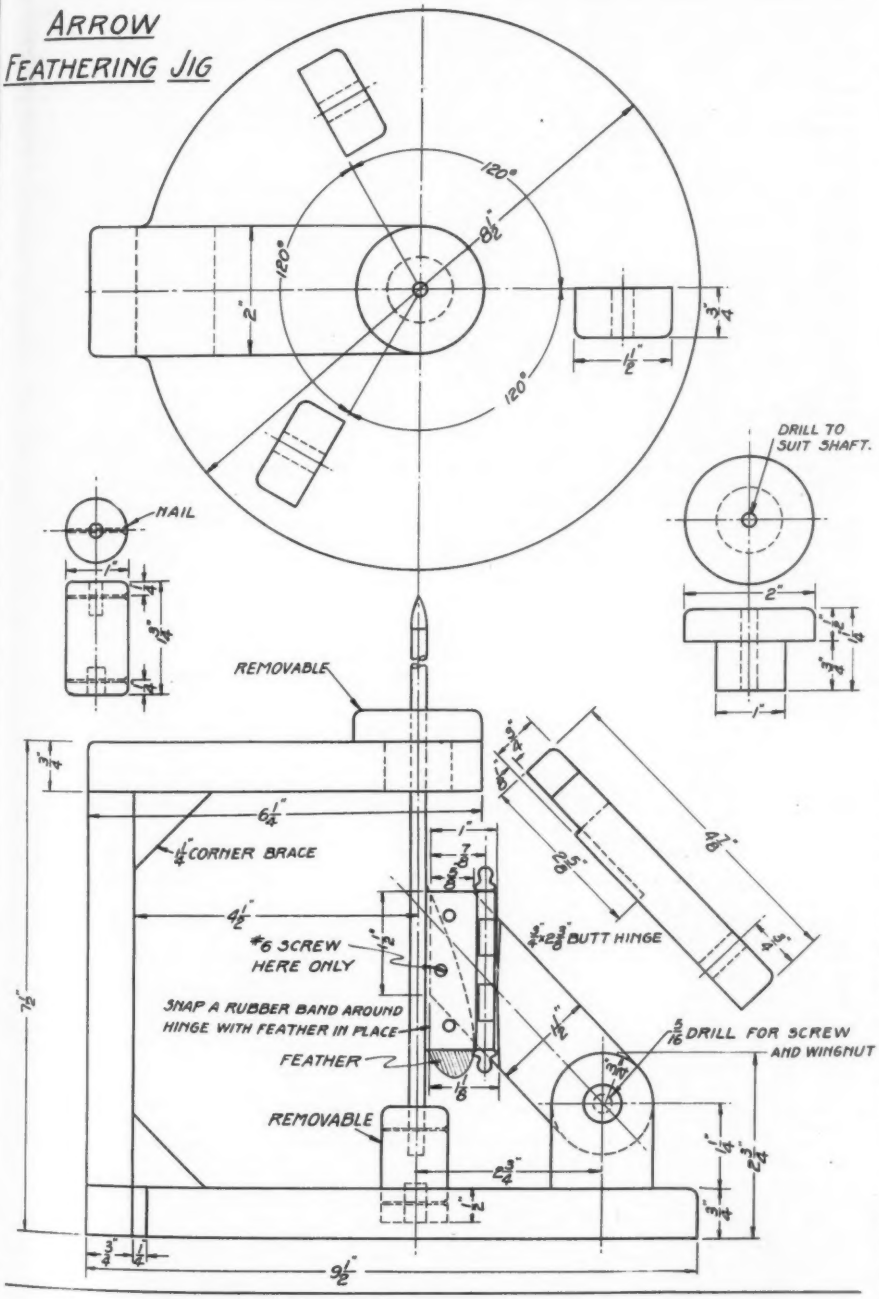
T. B. McGraw, Technical High School, Erie, Pennsylvania

With the interest in archery constantly increasing, schools are forming more archery clubs as a school activity. Thus the accompanying drawing, showing a method for feathering arrows securely and accurately, should be welcome. The school archery clubs, usually sponsored by the woodworking department, can build as many of these jigs as they find necessary.

The drawing shows the jig to consist of a base carrying a support to hold the shaft in a vertical position. On the base are mounted three lugs, each supporting a swinging arm. On each arm is mounted a butt hinge. The feather is held between the butts, and a rubber band is snapped over it lengthwise.

The glue is applied to the shaft and the projecting edge of the feather. The arm is then swung into the position shown against the shaft and held there by tightening the wing nut, clamping the arm against the lug. The jig is then set away until the glue has dried.

Removable bushings in the upper arm, and a reversible bushing in the base make the jig adaptable to any diameter shaft.



Arrow-feathering jig designed by T. B. McGraw, Erie, Pa.

Personal News

E. E. GUNN, VOCATIONAL LEADER DIES

On April 12, 1939, Edward E. Gunn, Jr., 54, of Madison, Wis., died of a heart attack in his home.

Mr. Gunn served for 23 years as assistant director for vocational education and supervisor for trade and industrial education. He was a resident of Madison for 20 years.

The late Edward E. Gunn

Born in Green Bay, on September 15, 1884, Mr. Gunn attended high school there and later was graduated with a B.A. degree from Stout Institute, Menomonie. He taught school in Green Bay for several years and served as principal of the high school there and later as city director of vocational schools for five years before coming to Madison.

Mr. Gunn was one of the first city vocational directors in Wisconsin and also one of the first to be employed by the state when the state department of vocational education was organized.

On numerous occasions he helped write vocational bills later enacted into law, and he taught vocational work and adult education during summer sessions at Washington State University, the University of Wisconsin, and Stout Institute. As assistant director of vocational education, he directed the work of city vocational schools throughout the state.

Mr. Gunn was a member of the American Vocational Association, the Wisconsin Teachers' Association, the Wisconsin Employees Association, and a former member of the Knights of Columbus and of the Elks Club.

FOUNDER OF CO-OPERATIVE EDUCATION DIES

Dr. Herman Schneider, the founder of the co-operative system of education in the United States and former president of the University of Cincinnati, died on March 28, at the age of 67. Dr. Schneider was made president of the University in 1929 upon the retirement of Dr. Frederick Hicks, and served until 1932. Since then he had been dean of the college of engineering.

Herman Schneider was born at Summit Hill, Pa., September 12, 1872. He was graduated from Lehigh University with the Degree of Bachelor of Science in Architecture in 1894. Prior to entering Lehigh University he was a helper on a construction gang and on surveying parties and while in college organized for himself a plan by which he worked during the school year and summer vacations in the office of an architect and engineer, starting as a blueprint boy and ending as a designer at graduation. After graduation he entered private practice as an architect in Cumberland, Md., and designed about 300 buildings (churches, residences, stores, schools, and warehouses) and superintended the construction of about seventy-five of them. From October, 1897, to June, 1898, he designed a number of hotels and depots for The Oregon Short Line Railway, Salt Lake City. From June, 1898, to September, 1899, he was Superintendent of Construction for an architect.

In 1899 he became Instructor of Civil Engineering at Lehigh University and in that year proposed the co-operative plan of education. Efforts to find a sponsor for the plan were unavailing and in 1903 he went to the University of Cincinnati as Professor of Civil Engineering. In 1906 the Board of Directors of the University of Cincinnati made him Dean of the College of Engineering and approved the adoption of the co-operative system, whereby students spend alternate periods in industry and in the classroom. Since its adoption, the co-operative plan has been taken up, in some instances with slight modification to suit particular needs, by many high schools and colleges in the United States and abroad.

In 1919, the College of Commerce was combined with the engineering college to form the College of Engineering and Commerce, of which Dr. Schneider became Dean. The School of Applied Arts, founded in 1922, was under his directorship, as well as the Institute of Scientific Research which includes the Leather Research Laboratory of the Tanners' Council of America, the Lithographic Research Laboratory and the Basic Science Research Laboratory. Dr. Schneider assumed his duties as Acting President of the University of Cincinnati February 1, 1928, and was elected President on June 4, 1929. He withdrew from this office in 1932 because of illness. He returned to his former duties as head of the interrelated combination comprising the Institute of Scientific Research, the College of Engineering and Commerce, and the School of Applied Arts.

In 1911 the University of Pittsburgh conferred upon Dean Schneider the Degree of Doctor of Science. In 1933 the University of Cincinnati conferred the Degree of Doctor of Laws on him and made him President-Emeritus of the University. He was awarded the Sachs Prize by the Cincinnati Institute of Fine Arts for outstanding achievement during the year 1931 in the field of literature, art, and science. Dean Schneider was awarded the ninth Lammé medal by the Society for the Promotion of Engineering Education in June, 1936.

During the Great War, Dr. Schneider volunteered his services to the United States Government, and was made Chief of the Industrial Service Section of the War Department. In 1918, he was given membership in the advisory board of the Commission on Education and Special Training of the General Staff of the United States Army. From 1911 to 1913 he was a member of the Committee on School Inquiry of the City of New York and in October, 1914, he was appointed as adviser to Dr. Haaren. An important part of the work had to do with the introduction of the co-operative plan in the New York high schools. This work was terminated in April 1915, because of illness. He also served on the Advisory Council on Applied Physics, American Institute of Physics.

He is the author of *The Problem of Vocational Guidance, Education and Industrial Peace, Education for Industrial Workers* and numerous articles on educational subjects, research, economic problems, the applied fine arts, and the co-operative system. In 1917 he was placed on the honor roll of short-story writers of America for a series of stories published in *The Outlook* magazine.

♦ JAMES DOTSETH, who had been teaching machine shop in the Junior Technical High School in Flint, has accepted a new position in the Hamtramck Vocational School. Mr. Dotseth is also a part-time student at Wayne University where he is completing work on his master's degree.

Association News

♦ The Industrial Arts Club of Minneapolis, celebrated the golden anniversary of industrial-arts education in the Minneapolis schools at a dinner meeting on April 20, 1939.

This was a gala occasion and the club members attended in large numbers. Much to the disappointment of everyone, Mr. W. F. Decker, who had been the first manual-training teacher in the shop opened in September of 1888 at Central High School in Minneapolis, could not attend. Quite a number of the teachers who started in the early days of industrial arts in Minneapolis are still in the system, and much of the success and progress of the work in Minneapolis is traceable to their efforts to continually improve themselves and to keep up with advances made in their profession. A trip through Roosevelt High School, the Miller Vocational High School, and through the Ramsey Junior High School, gave ample evidence that Minneapolis educators had a real conception of what industrial arts and vocational education should mean in the lives of the young.

The industrial-arts club at this dinner also took occasion to honor the late J. E. Painter who, in his capacity as supervisor, had piloted industrial arts and vocational education in Minneapolis almost from the beginning. Mrs. Painter, who was present, expressed her delight at meeting once more the many shop teachers whose acquaintance in years gone by, had meant so much to her and to her husband.

The program consisted of a résumé of the progress made in industrial education, decade by decade. Mr. Newhall reviewed the first ten years, Mr. Barlow the second, Mr. Ringwalt the third, Mr. Hamstreet the fourth, and Mr. Ferree the fifth. Mr. Schweickhard made a forecast of the future. Dr. Homer J. Smith, as representative of the *Industrial Education Magazine*, and John J. Metz, as representative of the INDUSTRIAL ARTS AND VOCATIONAL EDUCATION Magazine, had been invited and were present at this memorable gathering.

♦ The April meeting of the School Crafts Club was held at the West Side Y.M.C.A. building, New York City.

After the business meeting, Mr. Harry W. Moorehead of the Denville Public School of Denville, N. J., gave a very interesting and educational lecture, *The Why and How of My Shop*.

The speaker, who is doing fine work in a unique way, exhibited a fine group of models made in his school shop. He explained his shop setup, aims and objectives, the way in which he works to accomplish them, the results which he obtains, how he secures correlation and co-operation, and how research may be carried on.

The annual banquet of the School Crafts Club will be held on Saturday, May 20, at the Hotel Imperial, Broadway and 32nd St., New York City. The speaker for the evening will be Professor Hutchcroft of Teachers College, Columbia University. His topic will be *Industrial Arts of Tomorrow*.

♦ The Kentucky State Industrial Arts Association met as a regular division of the Kentucky Education Association in Louisville, Ky., on April 13 and 14.

The first meeting was held at the duPont Manual Training High School on April 13. Mr. Ralph W. Whalin, President of the Association, called the group together promptly at 2:00 p.m. After a brief address of welcome, he introduced Mr. J. D. Williams, Director Training School, University of Kentucky, who spoke on *Industrial Arts in the Modern School*.

Dr. William A. Cook, Principal, Dayton High School, Dayton, Ky., was the next speaker. He chose for his subject, *Industrial Arts from the Administrative Point of View*.

A committee composed of L. T. Smith, Bowling Green; N. G. Denston, Richmond; A. N. May, Lexington; and Edwin Paul, Louisville, presented a constitution which they had developed during the past year. It was voted upon and adopted.

Also, in connection with this meeting, there was an exhibit of projects or devices that had proved successful in school during the past year.

The second meeting of the session was held on April 14. The group assembled at noon in the Old English dining room of the Watterson Hotel for a luncheon. Mr. Whalin, President, called the meeting to order. By reason of some former association, the secretary, Edgar Mara, was granted the privilege of introducing the speaker, Dr. Homer J. Smith, Professor of Industrial Education, University of Minnesota, Minneapolis. Dr. Smith spoke on *A Program of Industrial Arts*.

At a business meeting immediately following Dr. Smith's address, the following new officers were elected for the ensuing year: C. R. Uphoff, Hopkinsville, president; V. R. Catlett, Louisville, vice-president; Edgar Mara, Covington, secretary-treasurer, and David M. Wherry, Dayton, as a new member of the executive committee. Ralph W. Whalin, Richmond, the retiring president automatically becomes a member of the last-mentioned committee. — *Edgar Mara*.

♦ The distributive-education workers of the State of Utah met March 3 and 4 at Ogden, Utah, in a conference which was planned by Mr. H. B. Gunderson, State Director of Vocational Education, together with Mr. Leonard Ralphs, Supervisor of Distributive Occupations. Most of those who attended from all parts of the state had the pleasure of hearing Dr. Walter F. Shaw, Special Agent for Distributive Education, Western Region, Office of Education, Washington, D. C., who was the principal speaker.

At the close of the Conference, Dr. Shaw made mention of the fact that California and Montana have organized Distributive Occupation Clubs and through these clubs the work throughout the state is being more effectively done. The enthusiasm with which he spoke of these clubs carried over to the group and before they adjourned a Distributive Occupations Club of Utah was formed which is the third in the United States. Mr. James E. Haslem, Co-ordinator in Business and Distributive Occupations for the Salt Lake City Schools, was elected president. Mr. LeRoy A. Blaser, Vocational Co-ordinator for Weber College, was elected secretary. — *LeRoy A. Blaser*.

♦ The seventh annual Eastern Pennsylvania Industrial Arts Conference was held at the Millersville State Teachers College, Millersville, Pa., Saturday, April 15. Over 500 industrial-arts men and school administrators attended.

Dr. C. O. Williams, Assistant Director of the State Department of Public Instruction, was chairman of the morning meeting. The address of welcome was made by Dr. Landis Tanger. Dr. Theodore L. Reller, School of Education, University of Pennsylvania, spoke on *The Meaning of Adult Education*.

The luncheon meeting was capably handled by Lane C. Ash, of the State Department of Public Instruction, toastmaster. He introduced Dr. P. L. Cressman, State Director of Instruction. The luncheon group was entertained by a little German band, composed of Millersville industrial-arts students. The feature of the luncheon meeting was an address *Prevocational Responsibilities of Industrial Arts* by John J. Seidel, State Director of Industrial Education in Maryland, and vice-president of the American Vocational Association.

The Conference concluded with the semi-annual banquet and initiation ceremonies of the Iota Chapter of the Iota Lambda Sigma Fraternity. The speaker at the fraternity banquet was Burl N. Osburn, of the State Teachers College. He described, in interesting fashion, typical

organized projects in connection with adult education throughout the United States. — *E. E. Howard.*

♦ The annual meeting of the North Carolina Vocational Education Association was held in Raleigh on Friday, March 17. Neal A. Adkins, retiring president of the association presided at the dinner meeting at which Dr. Paul W. Chapman, University of Georgia, was the main speaker. The members of the association honored Mr. T. E. Brown, State Director of Vocational Education, by presenting him with a life membership to the American Vocational Education Association in recognition of his 21 years of service in the field of vocational education in North Carolina. Miss Isabel Mosley, home economics, Chapel Hill, was elected as president for the coming year. — *Neal A. Adkins.*

♦ Two thousand Western Pennsylvania public-school teachers, supervisors, and administrators interested in industrial-arts education attended the Seventh Annual Western Pennsylvania Industrial Arts Conference at the State Teachers College, California, Pa., on Saturday, April 22.

High lights of the occasion were addresses by Dr. Boyd H. Bode and Dr. William E. Warner, both of Ohio State University. Dr. Warner spoke on *The Modern School Becomes a Laboratory for Living* at the morning session, and also addressed the luncheon audience on the topic *Ten Years of Progress in Industrial-Arts Education.* Dr. Bode chose as his topic *Social Implications of Industrial Arts* for the luncheon meeting, which was presided over by Dr. Clarence E. Ackley, Deputy Superintendent of the Department of Public Instruction in Pennsylvania.

Educational exhibits and practical demonstrations in industrial-arts activities gave visitors to the college an opportunity to see developments in this rapidly expanding aspect of public-school education.

Arrangements for the conference were made by Mr. Shriver L. Coover, head of the Department of Industrial Arts. He was ably assisted by students in the department and members of the staff, including Arthur W. Bauer, A. J. Hoover, R. Lee Hornbake, Robert M. Keck, Miss Rose A. Leacock, and Anthony T. Stavaski. — *George C. Donson.*

♦ The Illinois Vocational Association convention held at Moline, Ill., April 13–15, 1939, at the LeClair Hotel, was well attended. The conference of trade and industrial supervisors and school administrators was the first meeting of the convention on Thursday morning. Robert Shumway, Supervisor of Vocational Education, Rockford, Ill., was the chairman. A. D. Matheson, Superintendent, French and Hecht, Inc., Davenport, Iowa, discussed the problem of apprenticeship training at this meeting.

Another meeting was held Thursday afternoon at which E. W. Freeman, Secretary of Board of Education and Director of Industrial Education, Moline, Ill., was the chairman. The problems discussed were *Organization of Evening Schools for Employed Workers,* W. J. Colohan, Superintendent of Schools, Woodstock, Ill.; *Trade Training in the Small Cities,* Allen R. Edwards, Principal of High School, Marion, Ill.; *Training Program as Carried on Between the Manufacturing Plants and the Schools,* J. E. Blue, Principal of High School, Rockford, Ill., and *Discussion of State Reports,* J. W. Thompson, State Supervisor of Trade and Industrial Education, Springfield, Ill. The trade and industrial dinner was held at 6:30 p.m. on Thursday. The toastmaster on this occasion was Alexander M. Sullivan, Vocational Director, Chicago, Ill.

C. A. Bell, State Director of Vocational Education, Springfield, Ill., spoke on *Vocational Education in the Public Schools;* E. P. Nutting, Superintendent of Schools, Moline, Ill., spoke on *Trade and Industrial Education in the Public Schools;* C. R. Rosborgh, President, Moline Tool Company, Moline, Ill., discussed *Training in Industry;* John Walker, Former President of State Federation of Labor, Springfield, Ill., spoke on *Training of Boys and Girls to Earn a Livelihood,* and N. B. Giles, Regional Agent for Central Division of Trade and Industrial Education, Office of Education, Washington, D. C., discussed *The Needs for Apprentice Training.*

A number of interesting tours had been arranged for, one taking the teachers through the John Deere Plant, another through the International Harvester Plant, and a third through the Rock Island Arsenal. Contests in auto mechanics, drafting, and machine shop were held Friday morning from 8 a.m. until 12 a.m. A goodly number of students were entered from the various vocational schools in Illinois and to see the workmanlike way in which these youngsters went at their work in the contests was really encouraging.

Great credit also is due to C. C. Cramer, Northern Illinois State Teachers College, DeKalb, who was the general chairman of the educational-exhibits committee for inducing so many schools to send in the material which made up the excellent educational-exhibits section at the convention. The excellent response in presenting outstanding school-shop work for exhibition purposes cannot be praised too highly.

At the round-table luncheon held at 12:30 p.m. on Friday, Julian C. DuCray, Chairman, Western Illinois Round Table, Moline High School, was the chairman. Mr. J. Morgan Johnson, chairman of the convention and president of the Industrial Education group of the Illinois Vocational Association, gave the address of welcome. Dr. Harry C. McKown, Gilson, Knox County, Ill., gave his thought-provoking and amusing lecture on *Who Ever Heard of Such a Thing?* Sectional meetings on personnel and guidance, part-time and full-time trade and industrial education, auto mechanics, drafting, electromechanics, general shop, machine shop, and metals, printing, and woods, were held Friday afternoon.

At the annual banquet held Friday evening, C. F. Anderson, President Illinois Vocational Association, was the chairman who introduced Earl H. Hanson, Superintendent of Schools, Rock Island, Ill., as toastmaster. Earl Smith, President, Illinois Agricultural Association, gave an excellent presentation on how the removal of the disparity between industrial costs and farm prices would remove most of the causes of present-day economic conditions.

At the Saturday morning industrial-arts forum, Paul E. Harrison, Northern Illinois State Teachers College, DeKalb, Ill., acted as chairman. The first speaker, Dr. Louis V. Newkirk, Director of Handwork, Chicago Public Schools, gave an excellent presentation of what is being done in the field of industrial arts in the elementary schools of Chicago. Lester C. Smith, Laboratory School, University High School, Chicago, called attention to the fact that technologists maintain that 2½ hours a day per worker, 20 hours a month, and 20 days a month would be sufficient to produce all that is needed. In the face of these facts, he discussed what industrial-arts work should be in the junior high school.

Arthur B. Mays, Professor of Industrial Education, University of Illinois, Urbana, emphasized the fact that intellectual values in industrial-arts work must be stressed as much as consumer values. Right methods of thinking and the establishment of good habits must be the aim in both the junior and the senior high school. He suggested that in the senior high school the work must be of the intensive type, that it should require skill and that high standards of workmanship should be maintained with a stressing of technical information of a high type — physics, chemistry, mathematics — in order to lay a broad foundation of basic knowledge which would later be helpful to obtain real vocational education. E. J. Simon, Director of Vocational Education, Champaign, stated that according to his idea, the unit-type shop was best adapted to prepare the senior-high-school student for entry into the vocational school. He emphasized the fact that tradesmen invited to come before the shop classes could do much in giving the students the right idea toward conditions in industries.

H. P. Harshbarger, Director, Practical Arts Department, Maine Township High School, Desplaines, gave an interesting discussion on adult education which he said was not of the elementary, secondary, or college type. According to his idea, San Jose, Calif., has probably the best developed adult-education center in the country. He mentioned that industrial-arts and commercial subjects are chosen by about 50 per cent of the adults who take up the work partly for business and partly for recreational pursuits. San Jose has introduced a good feature in what they call the "father-and-son fix-it shop" where the fathers work with the boys, in producing things for the home.

H. P. Harshbarger was elected as vice-president for this section.

The Epsilon Pi Tau Fraternity sponsored the Illinois Industrial Education luncheon held at 12:30 p.m. Saturday. This was an informal open meeting for all members of the Illinois Vocational Association and their friends. Paul E. Harrison who was the chairman at the luncheon turned the meeting over to J. Morgan Johnson, Moline Public Schools, at about 1:45 p.m., when the annual business meeting was started.

According to a rotating schedule, the next president of the Association will be from the Home-Economics Division and this will be decided at a Board of Control meeting some time in the fall.

The next meeting place will be Chicago, Ill.

♦ The 12th annual convention of the Michigan Industrial Education Society was most successfully carried out at the Pantlind Hotel, Grand Rapids, Mich., April 27–29, 1939. The convention was opened with a dinner at 6:30 p.m., Thursday, April 27. Arthur L. Reagh, President, Michigan Industrial Education Society, presided. The address of welcome was given by A. W. Krause, Superintendent of Public Schools, Grand Rapids, Mich., after which John Backus, Educational Director, American Type Founders Association, and Dr. Ralph H. Woods, President, American Vocational Association, addressed those present.

The city Directors Council met at a breakfast meeting at 8 a.m., Friday morning. C. E. Karlstrom, Roosevelt School, Detroit, Mich., acted as chairman, and James McKinney, Educational Director, American School, Drexel Avenue at 58th Street, Chicago, Ill., read a paper prepared by Thomas Diamond, University of Michigan, who unfortunately had to be absent. The question of combining the Michigan Industrial Society Education with the teachers of agriculture, business, home economics, industrial arts, and trade and industrial education, so that all of them could hold their convention at the same time and place, was then discussed. It was emphasized that each organization is to keep its identity, but that all of them are to meet at one time in order to do away with the many interruptions that the conventions of the separate organizations have hitherto produced in the school year.

George B. Frazee, Principal, Davis Vocational High School, Grand Rapids, Mich., was elected to be chairman of this section for next year and Dewey F. Barich, Trenton High School, Trenton, Mich., secretary.

At 10:15 the Future Craftsmen of America met under the chairmanship of Harvey A. Smith, Fordson High School, Dearborn. The speakers of this occasion were: James Cameron and Andrew Althouse.

Both Western State Teachers College and Epsilon Pi Tau had luncheon meetings at 12 o'clock. In the afternoon, division meetings on apprenticeship training, industrial-arts work, related subjects, the small high school, and vocational education were held. Speakers for these various events were: Harry J. Kelly, Clyde A. Bowman, L. H. Lamb, G. H. Hargitt, A. Clark, Frank Gordon, George Grosser, George H. Fern, M. J. Sherwood, Elmer Rewalt, and Kenneth Meade.

The annual banquet held at 7 p.m., Friday evening, was attended by a capacity crowd. The entertainment feature, consisting of the presentation of light opera chorus numbers by students of the Hamtramck Light Opera Ensemble, directed by Lee Olmstead, was outstanding. President A. L. Reagh presided at the banquet. The address of welcome was given by Honorable Judge Dalton, President of the Board of Education, Grand Rapids, Mich. Dr. Charles F. Bauder, Director, Industrial Education, Philadelphia, in speaking on *Expanding the Program of Industrial Education in the Public Schools,* pointed out the close relationship of industrial arts and industrial education with the other subjects in

a modern educational system. He showed that the increased enrollment of schools demonstrated the need for improvement in all educational offerings, and that these offerings have to be so given that the students, whether they be of the superior group, the above-average group, average or below-average group can all enjoy equal opportunities for developing to the fullest extent of their capacity.

Life membership in the Michigan Industrial Education Society was extended to Dr. Cleo Murtland, University of Michigan, Dr. George Myers making the presentation.

At the breakfast meeting sponsored by Mu Sigma Pi at 7 a.m., Saturday morning, Dr. Verne C. Fryklund, Professor of Industrial Education, Wayne University, was toastmaster. At this meeting, A. C. Tagg, State Department of Instruction, gave an interesting address on the need for guidance throughout the school life of the student and even extending beyond graduation. He also discussed the need for thorough understanding and training of counselors for the serious task of guiding youth.

At the symposium held at 9 o'clock Saturday morning, Earl L. Bedell, Director Vocational Education, presided. The speakers at this occasion were Dr. Charles F. Bauder, Dr. Warren K. Layton, Dr. Franklin J. Keller, Mr. George Fern, and Miss Blanche Nechanicky.

Round-table discussions on air conditioning and refrigeration, auto mechanics and aeronautics, electricity, general shop and woodwork, guidance and woodworking, machine shop, mechanical drawing, patternmaking, printing, and related education, were also held. At the luncheon held at 12:15 p.m., Thomas P. Garrity, Vice-President, Michigan Industrial Education Society, presided and Dr. F. J. Keller, Principal, Metropolitan Vocational High School, New York City, gave an address on *What is General Vocational Training? A Critique of the Report on Vocational Education by the President's Advisory Committee on Education.* In his address, he pointed out that the preparation for occupation cannot be left to chance or to an employer, that apprenticeship is good but that it will reach but a comparatively small number. Vocational education, therefore, must balance up a program which will reach many individuals, that it must include a great deal of guidance, and that it must produce a successful job for every individual.

The usual good Ship's program followed.

The officers for the coming year are: Thomas P. Garrity, president; C. E. Highlen, vice-president.

New Publications

Practical Electricity

By John E. Crawford. Cloth, 277 pages, illustrated. Price, $1.96. Published by The Bruce Publishing Company, Milwaukee, Wis.

A basic text in the theory and practice of electricity designed for the students of industrial arts and vocational education. The book covers the general field of electricity as fully as is consistent in a first course. The mathematics required to solve the problems given in the book (some 500 or more) can be easily handled by students who have not advanced beyond common arithmetic.

The book is written in a thoroughly interesting way. This is quite apparent from the headings of the chapters: Circuits — Highways of Electrons; Current — Electrons Flowing; Resistance — Crowding the Electrons; Voltage — Pushing Electrons; Direct-Current Generators — Organizing Electrons; Direct-Current Motors — Electrons Working; Power — Energy of Electrons; Alternating Currents — Reversing Electrons; Distribution Systems — Delivering Electrons; Electricity in the Home — Domestic Electrons; 30,000-Volt Tesla-Coil Project; The Future of Electricity: and Electrification.

Arithmetic for Printers

By J. Woodard Auble. Cloth, 170 pages, 5⅞ by 8¼, illustrated. Published by the author at 44 S. Ritter Ave., Indianapolis, Ind.

This is the second edition of this book. It shows the student just how to apply common arithmetic to the many problems which arise in the printing shop.

Starting out with a review of the fundamental mathematical operations, the book takes up percentage, the point system, compound numbers, spacing a line, spacing a given area, weight and cost of type metal, wage problems, ratio and proportion, ratios commonly used by the printer, percentile proportional shapes, paper weights and sizes, paper costs, cutting paper stock, allowance for spoilage, allowance for trim, and estimating coverage for ink.

Fundamentals of Leathercraft

By Ross C. Cramlet. Cloth, 63 pages, 6 1/8 by 9 13/16, illustrated. Price, $1. Published by The Bruce Publishing Company, Milwaukee, Wis.

An elementary treatise on leathercraft for the beginner in school or home shop. The story of leather is briefly told. The sources of materials and the tools required for leatherwork are then discussed. After that the creating of the design is explained, the processes of modeling and decorating of leather shown, and the methods of dyeing, lacing, and finishing commented upon.

Then there are short and precise directions given for making a number of very handsome and interesting projects.

The entire book is well illustrated, half tones being used for most of the tool processes while line drawings make clear the construction of the projects.

Indian and Camp Handicraft

By W. Ben. Hunt. Cloth, 80 pages, 9¼ by 12¼, illustrated. Price, $2. Published by The Bruce Publishing Company, Milwaukee, Wis.

This book contains explanatory material and full-page illustrations on thirty projects that will be the delight of every boy who loves the out of doors, camp life, and Indian lore.

The material is the outcome of the author's efforts to help the members of a boy-scout troop do work that is interesting and worth while. Every piece described has been made, either by the author or by one or more of his scouts. Many of the pieces have been made by every member of his troop.

The projects need little if any new or bought material. The boy is directed continually to use what he can find in field and forest. He is thus taught to make articles and equipment in the manner in which the Indians and the early pioneers made them.

A Marblehead Model Sailing Yacht

By Claude W. Horst. Paper, 39 pages, 8¾ by 11¼, illustrated. Price, 50 cents. Published by The Bruce Publishing Company, Milwaukee, Wis.

A description of a fine 50-in. sailing yacht with full instruction for laying out the templates, gluing up the lifts, shaping the inside and outside, making the backbone, and fastening the hull halves together. The book gives the full-sized station templates to make it easier for the builder of this pleasing and speedy yacht.

The making of details such as the jib rack, jib mainsail travelers, the hatch, adjustable mast step, masts and sails, steering quadrant, chain plate, bowsers, and the casting of the lead keel are all clearly described.

There is also a chapter on sailing techniques which will greatly aid the amateur model yachtsman get the best out of his boat.

Consumer Science

By Alfred H. Hausrath, Jr. and John H. Harms. Cloth, 692 pages, 6½ by 9½, illustrated. Price, $2.40. Published by The Macmillan Company, New York City.

The authors emphasize the need for habituating oneself in scientifically studying and analyzing not only one's needs, but also the wherewithal to satisfy these needs.

The book is primarily intended for students who are not taking the regular courses in physics and chemistry. It, therefore, provides a fairly full treatment of the many physical and chemical principles involved in the foods, clothing, and other commodities commonly purchased and used by man.

In this way, such questions as: "What is a good lubrication for auto? What constitutes a good fuel for motors?," etc., are analyzed.

The book is profusely illustrated and contains many diagrams and graphs.

Painting and Decorating

By J. Ralph Dalzell and Alvah Horton Sabin. Cloth, 152 pages, illustrated. Price, $1.50. Published by The American Technical Society, Chicago, Ill.

This is a book on the principles and skills needed by the practical house painter. It describes the function of paint, and of the various kinds of coverings used. It also gives information about solvents, fillers, lacquers, and varnishes, the specifying of the materials that are to be used, and how paint is to be mixed for use on various surfaces, both for exterior and interior use. There are also chapters on the use of different types of finishes; estimating costs; analyzing costs; and quantity estimating for sizing, calcimining, and wallpapering.

Electric Welding

By Morgan H. Potter. Cloth, 126 pages, illustrated. Price, $1.25. Published by The American Technical Society, Chicago, Ill.

This is a practical text covering the principles and application of the various types of electric arc welding.

It describes the different kinds of welding such as blacksmith, gas, Thermit, electric resistance, and electric arc welding. The equipment used for electric welding is also described and explained. Besides this, there are chapters on the preliminary preparation required for welding, flat welding, vertical welding, overhead welding, welding heavier plates, arrangement of beads for various jobs, strength of weld, weldability of various metals, miscellaneous welding jobs, and welding machines using power-tube rectifiers.

Modern Methods in Archery

By Natalie Reichart and Gilman Keasey. Cloth, 132 pages, 5¼ by 7½, illustrated. Price, $1. Published by A. S. Barnes and Company, New York City.

A well-illustrated book which is helpful in teaching beginners how to use and care for bows, arrows, and other archery equipment.

News Notes

♦ In co-operation with the Connecticut State Trade School at Bridgeport, Conn., American Type Founders is organizing a course of instruction for pressmen covering the ATF 17 by 22 Kelly, the Style B Kelly, and the C&P Craftsman automatic press. Registration opened Monday, May 8, and will continue for five weeks. The sessions will run five days each week from 6:30 to 8:30 p.m.

♦ Current interest of the transportation world in the Diesel engine is given educational aid and added impetus by an illustrated booklet "Dodge and Diesel." A copy of the booklet will be mailed free, to anyone writing for it to the Truck Sales Department of the Dodge Division of Chrysler Corporation, Detroit, Mich.

♦ Machine-shop equipment for the Redford High School, Detroit, Mich., has been purchased. This will give the school a total of four shops in the vocational department.

♦ In the month of December, Detroit, Mich., dime stores employed upward of 1,000 Detroit high-school girls, mostly seniors. This is part of an annual program in which the dime-store managers are co-operating with the placement division and the schools in giving opportunity for "experience" and part-time employment to qualified girls. The prospective employees are carefully selected, principally from retailing classes, by the high-school counselors working in co-operation with the store managers. They are then given a short intensive course in practical salesmanship, store etiquette, cash-register operation, and mathematical calculation. Many of the girls are retained for continued part-time employment.

♦ Carnegie Institute of Technology, in co-operation with the Westinghouse Electric & Manufacturing Company, has begun a search for

(Continued on page 10A)

Send them to the Disston Plant!

Years ago, Disston adopted a service of repairing and refitting school shop equipment . . . so that schools could get the best possible service from the tools used.

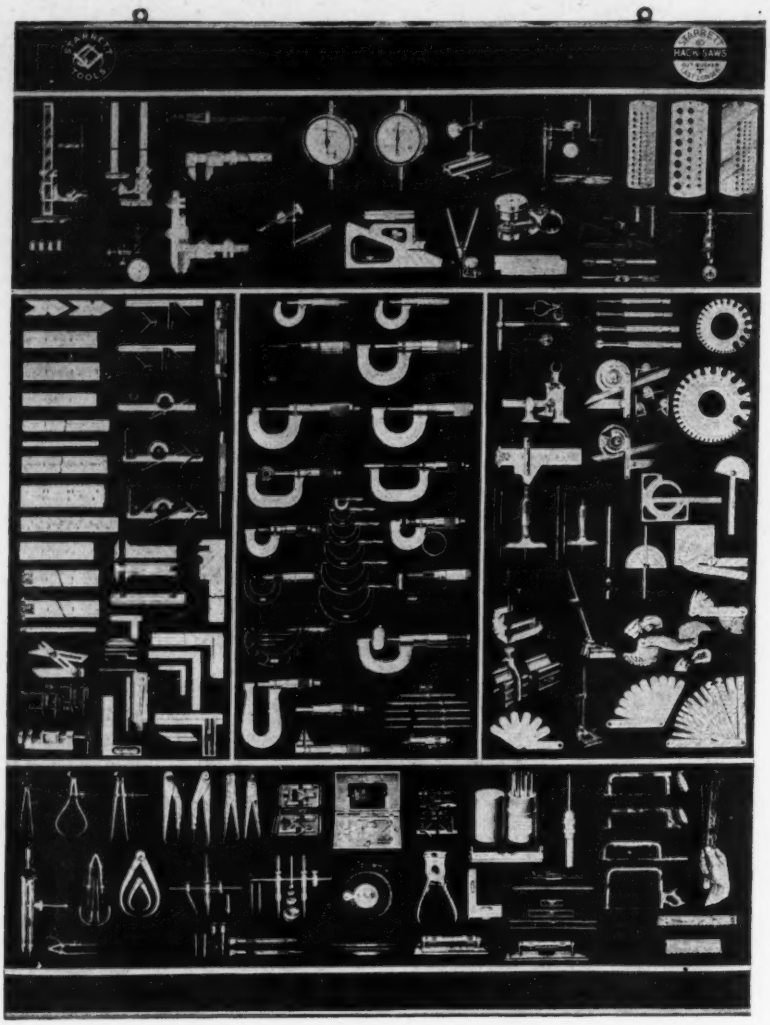
Skilled Disston workmen, in the Disston Plant, will put your hand saws, back saws, band saws, circular saws—all saws—in perfect working condition . . . and return them to you in ample time for the Fall Term.

Broken handles and missing screws replaced . . . saws jointed, set and filed as only Disston skilled workmen can do it . . . whatever your saws may need, this Disston service will supply it . . . and at nominal cost!

Send your school saw equipment to Henry Disston & Sons, Inc., Philadelphia—or to convenient branches at 111 N. Jefferson Street, Chicago; 4th Street & Massachusetts Avenue, Seattle, Wash.

Learn the nominal cost of this Disston Service by writing for the Disston Refitting Price Sheet. Address:

HENRY DISSTON & SONS, INC., PHILADELPHIA, U. S. A.



STARRETT TOOL CHART **Showing a representative assortment of Starrett Precision Tools. Handsomely printed in two colors on cloth, 30 x 40 inches. Available without charge while they last to instructors of metal working or apprentice classes. Write on your school or company letterhead.**

THE L. S. STARRETT CO., ATHOL, MASS., U. S. A.

(Continued from page 260)

the second group of 10 boys who will be trained as engineers under a five-year "work-learn" study program, made possible by the Westinghouse Company in conjunction with its $200,000 appropriation to the Institute in 1937.

The co-operative engineering educational plan, which enables the student to obtain practical experience in Westinghouse plants during five summer vacations and two college semesters as well as to complete eight semesters of college classwork, was launched last summer with the selection of the first 10 scholarship students.

When in complete operation, the scholarship courses will include 50 students, with 10 scholarships becoming vacant every summer. Each scholarship has a value of $3,000 and is awarded to a student of exceptional ability, final selection being based on results of competitive examinations, character, and personality.

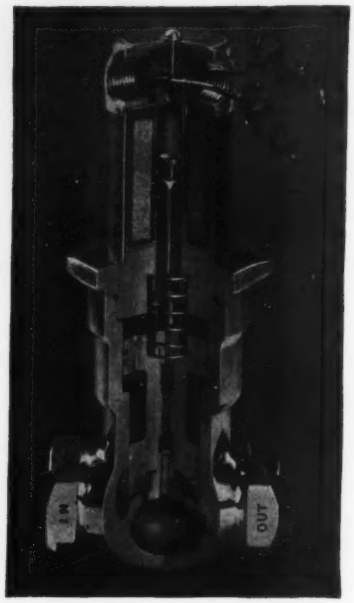
♦ Through the Association of Commerce, Milwaukee, Wis., industry has inaugurated its 1939 Foremen's Safety School, at the Milwaukee Auditorium. This training course is aimed to reduce industrial injuries and compensation costs. Ten weeks of intensive preparation on the part of the Committee Personnel of the Safety Division is incorporated in the 24 sectional meetings outlined in the program. The school has been an important factor in the 60 per cent reduction in industrial injuries and casualties with a saving to Milwaukee business last year of $1,250,000 in compensation costs.

New Products

Atkomatic Valve

E. C. Atkins and Co., 404 S. Illinois St., Indianapolis, Ind., have announced their new electrically operated "Atkomatic valve." This valve is particularly adaptable for difficult, continuous operations on steam up to 150-lb. pressure and operations where accuracy of operation is required, such as automatic control of elevators and lifts, automatic timing devices and accurate temperature controls. It also has general application on automatic or remote control of liquids or gases.

The main features of this valve are its simplicity, durability, and timing. The line pressure is the main actuating force, acting on a piston. It has nonmetallic valve disks which



require no regrinding, and insure maximum wear and tight seating for each particular service. All parts are of finest bronze and stainless steel. Electrical connections may be placed in any desired direction.

New Small-Hole Gauge

THE STARRETT SMALL HOLE GAUGES are designed by the L. S. Starrett Co., Athol, Mass., for measuring small holes and internal dimensions less than those ordinarily handled with telescoping gauges. The small-hole gauges are available in sets of four, covering the ranges ⅛ to 2/10 inch, 2/10 to 3/10 inch, 3/10 to 4/10 inch and 4/10 to ½ inch.

The end of each gauge is in the form of a split ball which is expanded by a cone controlled by the knurled knob at the end of the handle. The ball is placed in the hole, expanded to get the "feel" and the measurement transferred to a micrometer. These gauges are nicely balanced, highly sensitive in contact and adjustment and are hardened against wear.

A Valuable Service TO INSTRUCTORS

Send now for a set of these STANLEY WALL CARDS—visual teaching aids showing the correct use and care of common woodworking tools.

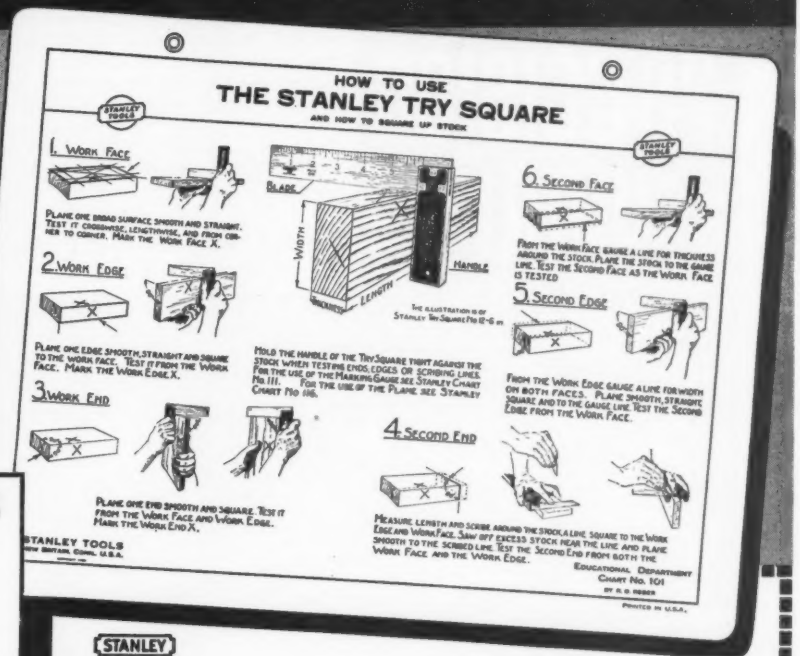
They make instruction easier, simplify the task of preparing assignments, save long detailed explanations.

A set consists of 16 cards, printed both sides—32 subjects. Printed on extra heavy cardboard, protected with coating of clear lacquer. Easily cleaned; permanent. Hooks for easy hanging are supplied.

Offered at our cost of printing and postage, $1.50 per set, delivered anywhere in the U. S.

STANLEY TOOLS

Educational Dept., New Britain, Conn.


HOW TO USE
THE STANLEY TRY SQUARE
AND HOW TO SQUARE UP STOCK
STANLEY TOOLS
1. WORK FACE
PLANE ONE BROAD SURFACE SMOOTH AND STRAIGHT. TEST IT CROSSWISE, LENGTHWISE, AND FROM CORNER TO CORNER. MARK THE WORK FACE X.
BLADE
WIDTH
LENGTH
HANDLE
2. WORK EDGE
PLANE ONE EDGE SMOOTH, STRAIGHT AND SQUARE TO THE WORK FACE. TEST IT FROM THE WORK FACE. MARK THE WORK EDGE X.
HOLD THE HANDLE OF THE TRY SQUARE TIGHT AGAINST THE STOCK WHEN TESTING ENDS, EDGES OR SCRIBING LINES. FOR THE USE OF THE MARKING GAUGE SEE STANLEY CHART No. 111. FOR THE USE OF THE PLANE SEE STANLEY CHART No. 116.
3. WORK END
PLANE ONE END SMOOTH AND SQUARE. TEST IT FROM THE WORK FACE AND WORK EDGE. MARK THE WORK END X.
4. SECOND END
MEASURE LENGTH AND SCRIBE AROUND THE STOCK A LINE SQUARE TO THE WORK EDGE AND WORK FACE. SAW OFF EXCESS STOCK NEAR THE LINE AND PLANE SMOOTH TO THE SCRIBED LINE. TEST THE SECOND END FROM BOTH THE WORK FACE AND THE WORK EDGE.
5. SECOND EDGE
FROM THE WORK EDGE GAUGE A LINE FOR WIDTH ON BOTH FACES. PLANE SMOOTH, STRAIGHT, SQUARE AND TO THE GAUGE LINE. TEST THE SECOND EDGE FROM THE WORK FACE.
6. SECOND FACE
FROM THE WORK FACE, GAUGE A LINE FOR THICKNESS AROUND THE STOCK. PLANE THE STOCK TO THE GAUGE LINE. TEST THE SECOND FACE AS THE WORK FACE IS TESTED
STANLEY TOOLS
EDUCATIONAL DEPARTMENT
CHART No. 101

LIST OF SUBJECTS - - STANLEY WALL CARDS

No. C129 Boring Tools	No. C118 Nail Hammer
No. C130 Hand Saws	No. C119 Screw Driver
No. C117 Bit Brace	No. C109 Common Wood Joints
No. C127 Hand Drill	No. C110 Common Wood Joints (Advanced)
No. C102 Doweling Jig	No. C103 Stanley Bailey Planes
No. C128 Spoke Shaves	No. C108 Common Cuts in Wood
No. C125 Butt Gauge	No. C101 Try Square
No. C126 "T" Bevel	No. C111 Marking Gauge
No. C123 Cabinet Scraper	No. C55 Riveting Hammer
No. C124 Hand Scraper	No. C56 Setting Hammer
No. C116 Stanley Plane	No. C53 Flat Cold Chisel
No. C122 Stanley Block Plane	No. C54 Cold Chisels
No. C114 Double Plane Iron	No. C51 Ball Pein Hammer
No. C115 Setting Stanley Plane	No. C52 Straight and Cross Pein Hammers.
No. C112 Grinding Stanley Plane Irons	No. C120 Use of Chisel (Horizontally)
No. C113 Whetting Stanley Plane Irons	No. C121 Use of Chisel (Vertically)

STANLEY
Trade Mark

STANLEY TOOLS
EDUCATIONAL DEPT.
NEW BRITAIN, CONN.

Enclosed find $1.50 (check or money order).
Send a set of Stanley Wall Cards to . . . .

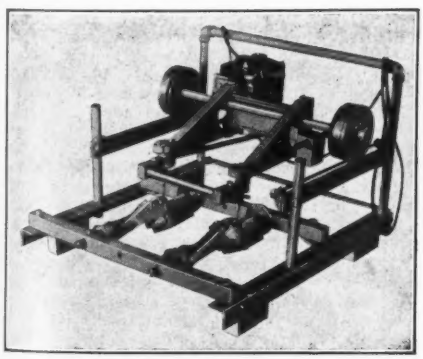
Name .....
(please print plainly)
Address .....
.....

The North Star Carver

The St. Paul Machinery Mfg. Co., Como Ave. and Marion St., St. Paul, Minn., are marketing the North Star Carver.

This machine will accurately reproduce carving of any shape or dimensions within the machine limits. Book ends, bowls, plaques, panels, or furniture parts can be handled with equal ease, saving much time and labor and producing a nicely finished job.

For vocational work the machine may be



used for simply roughing out, after which the job may be turned over to the student for finishing by hand.

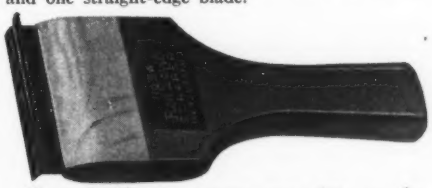
The North Star Carver is made with one or two spindles for light production or hobby work, but the industrial type operates with as many as 24 spindles, all doing a multiple carving job under the guidance of one operator. The value of the smaller machine for vocational work lies in the training it provides for the larger industrial job and the possibilities of revenue to be derived from its operation in the school.

At a recent exhibition at the St. Paul Vocational School, St. Paul, Minn., a large crowd was constantly watching the carver. With no more effort than is required to handle a single carving tool, the operator swings the machine up and down, right and left, in any direction, faithfully following the pattern while the machine does the actual work.

There are many variations possible in the operation of the North Star Carver, enabling it to carve a direct or reverse duplicate or to execute an original job.

Red Devil Wood Scraper with Serrated Blade

Landon P. Smith, Inc., Irvington, N. J., makers of the world-famous Red Devil glass cutters have originated a useful line of Red Devil wood scrapers equipped with one serrated-edge blade and one straight-edge blade.



These double-use scrapers save time on the job because a straight or serrated edge is always ready, at once. By quickly flipping over the tool, the scraping edge desired is ready for action without change of tools.

The extra-hard serrated-edge blade is very useful for scarifying old paint, rough surfaces, and other work. It is built for long use.

Both blades are replaceable, and can be purchased separately, in two sizes.

The new line of wood scrapers includes Nos. 4A, 5A, 8A, and 14A, and they retail at no extra cost over regular 4, 5, 8, and 14 series.

New 12-In. Floor Sander

The Porter-Cable Machine Company, Syracuse, N. Y., have just announced a new 12-in. floor sander. The design of this sander permits the use of a 12-in. machine on a greater range of work with increased efficiency and economy. It can be operated at higher speed for straight-away sanding, is compact, and can be easily maneuvered in smaller spaces, is dustless, and comes equipped with detachable motor, and is easy to handle from job to floor, and from floor to floor.

It has a drum which is balanced throughout its entire length. This effects great savings in abrasive paper, the even pressure permitting faster working and eliminating "digging in."

The swivel dust bag, positive drum control, instant drum alignment, resilient rubber-mounted drum bearings, the unit and chassis construction, and other features popular in Porter-Cable machines are incorporated in this new model.

Smaller Kaufmann Script

The American Type Founders, 200 Elmora Ave., Elizabeth, N. J., announce additional sizes in Kaufmann Script and Kaufmann Bold. It can now be had in 10, 12, and 14 pt. in both weights.

(Continued on page 12A)

MORE PRECISION WORK

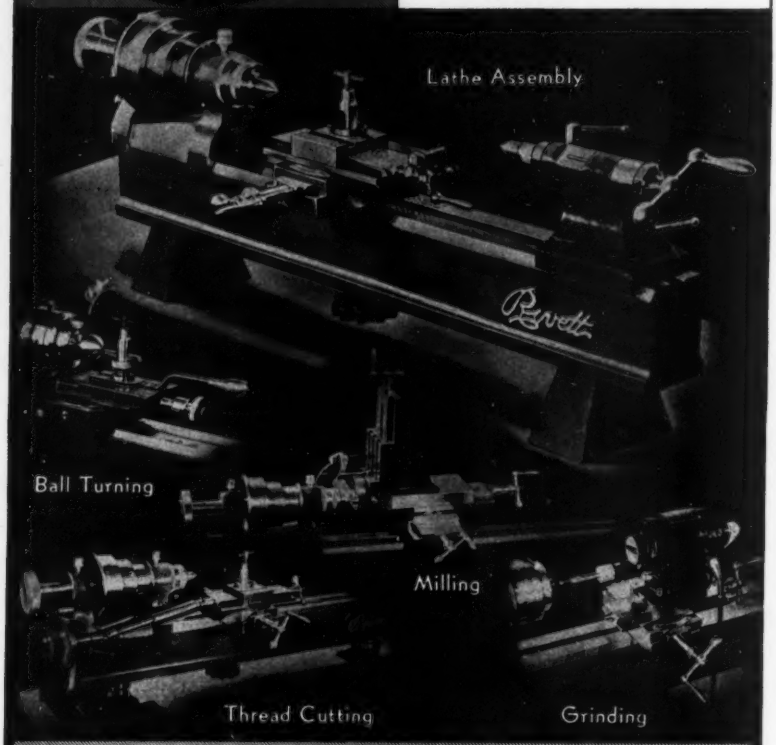
On Rivett 505

The correct lathe can be furnished in the 505 series for any production, tool room or experimental bench lathe work. A new 24 page bulletin covers the various sizes of plain, ball and roller bearing lathes, their complete line of attachments, mountings and drives.

Become acquainted with the possibilities for **MORE PRECISION WORK** in your shop on Rivett 505 plain bench lathes.

Write for Bulletin 505-E

RIVETT LATHE & GRINDER INC.
Brighton, Boston, Mass.



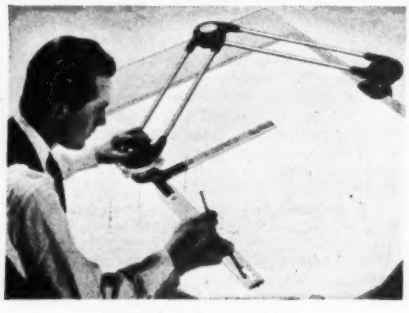
RIVETT

(Continued from page 11A)

Free-Floating Drafting Machine

The new Excello free-floating drafting machine, designed to minimize drafting fatigue, has been announced by the Eugene Dietzgen Co., Chicago, Ill. It will definitely permit draftsmen to work for many hours without strain and, therefore, with continuously greater accuracy. The *free-floating* feature which accomplishes this is obtained by the use of new lightweight alloys, roller bearings, and precision construction, together with an advanced method of "gravity control" that does not place a drag on the drafting machine's motions under any conditions. This latter feature eliminates both friction brakes and overhanging weights as the means of overcoming the effect of gravity when the Dietzgen Excello Drafting Machine is used on inclined drafting boards. The protractor head of this new machine also minimizes fatigue by placing the control of angles directly under the thumb without tiresome wrist twisting.

All moving parts are completely enclosed, protected against dust and handling. This feature, it is stated, not only eliminates band breakage which normally comes from handling but prevents the operator from cutting his hands on the bands' edges. The possibility of band breakage from temperature changes is eliminated by the use of noncontinuous bands which incorporate a most unique automatic tensioning arrangement which offsets the expansion or contraction which occurs.



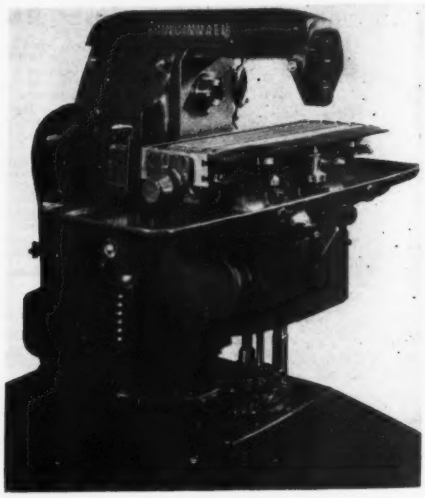
New drafting machine

The new Dietzgen Excello Drafting Machine is beautifully finished in nonglaring satin aluminum and black. It is obtainable for drawings up to 36 by 60 in., with either standard or civil engineers' protractor head as desired. The Excello chuck plates take all standard scales.

New Cincinnati 1–12 and 1–18 Plain Automatic Milling Machines

Two new plain automatic milling machines, the No. 1–12 and the No. 1–18, have been introduced by the Cincinnati Milling Machine Co., Cincinnati, Ohio. These machines are easy to set up, fast in operation, and designed for the rapid milling of small parts for all industries. A 3-h.p. motor, with totally enclosed drive, provides the power. The No. 1–12 has a power table travel of 12 in. and the No. 1–18 has a travel of 18 in.

The new machines feature dog-controlled, automatic table cycles with intermittent feeds, a hydraulic back-lash eliminator, an automatic spindle stop, screw feed to the table, and single-lever finger-tip start and stop lever for the table.



New Cincinnati plain miller

Sixteen spindle speeds, obtained through heat-treated pick-off gears and a back gear, from 50 to 1500 r.p.m. is standard. An alternate range of 40 to 1500 r.p.m. can be supplied at extra cost. The rotation of the spindle may be started or stopped by a control lever located on the left of the column. An automatic spindle stop, actuated at the end of the table cycle to prevent mishaps from revolving cutters during loading operations, is available at extra cost. The enclosed motor drives a constant-speed pulley through multiple-vee belts and a hinged motor mounting compensates for belt wear.

The drive includes a double mounting, both front and rear, of antifriction bearings for the spindle, and helical gears in the drive. This with automatic lubrication provides a quiet flow of power from the motor to the cutters. A spindle reverse is provided. The spindle nose is the national standard with the No. 40 series taper hole. A quick hand-adjustment and clamping lever for the quill, which is graduated in thousandths of an inch, are located on the right of the column.

A standard range of sixteen table feeds from ¾ to 30 in. per minute is standard. All feed changes are obtained by pick-off spur gears located in a compartment on the left side of the knee. Gears not in use are stored in a rack built into the motor compartment door.

(Continued on page 17A)

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(Continued from page 12A)

The No. 1–12 and No. 1–18 milling machines are patterned generally after the Cincinnati knee- and column-type millers. They have a pyramid-type column with a self-aligning Cincinnati rectangular overarm and lightweight arbor supports, and a vertical hand adjustment of 8 in. for the knee.

The Starret Wiggler

THE STARRETT WIGGLER is a handy and inexpensive tool developed by the L. S. Starrett Co., Athol, Mass., for jig and tool work on milling machines, drill presses and similar vertical machines where it is necessary to locate working points with considerable accuracy. It consists of a spring-tensioned pointer held in a tapered shank with the pointer free to wiggle. With the center finder set in the chuck or tool

The wiggler in use

holder of the machine, and the pointer properly guided, it is a simple matter to bring the working point of any job into perfect alignment with the machine spindle. The tension of the spring which bears on a ball on the end of the pointer can be adjusted by a screw in the back of the shank. This spring cushions the pointer and protects it against damage or distortion if the center finder is brought into too firm contact with the work. The pointer can be telescoped into the body when not in use.

New Trade Catalogs

THE BEHR-MANNING CORPORATION, Troy, N. Y., have announced their new catalog No. 18 entitled "Oilstones and Abrasive Specialties."

This is a comprehensive reference book on sharpening stones. Within its covers will be found not only the famous old natural stones like Arkansas, Washita, and Queer Creek, but side by side with them are the most modern electric-furnace products made from aluminum oxide and silicon carbide. The book is profusely illustrated, and contains many descriptions which are brief but to the point. All tables are set for easy reading. Included is a special completely itemized index, making it easy to locate any specific item or number in a moment.

A NEW No. 34 POCKET-SIZE CATALOG has just been issued by Stanley Tools, New Britain, Conn. It has 240 pages illustrating and describing the complete line of Stanley and Stanley-Atha Tools, many of which are brand new.

In addition, the new catalog contains tables of measure, weight, surface and capacity, information on brickwork, flooring and siding, lumber, nails and roofing.

Trade News

Col. Samuel M. Nicholson Dies

Col. Samuel M. Nicholson, president of Nicholson File Company and the American Screw Company, passed away at the age of 78, at his home in Providence, R. I.

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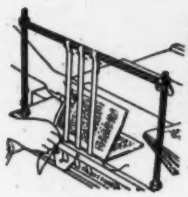

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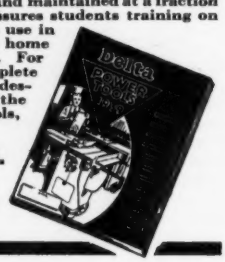

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